

ZL50G 轮式装载机
ZL50G WHEEL LOADER

维修手册
SERVICE MANUAL

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1. Preface



1.1 Preface

This manual is designed to help service people understand the machine structure and its working components, guiding service people how to make correct breakdown diagnosis and give trouble-shooting remedies to the machine. This manual also outlines the standards on maintenance and service for the machine under the normal and special working condition, so that it will help service people improve service quality for the machine.

This manual totally consists of the following chapters:

"Preface" is consisted of How To Use This Manual, Instruction on Hoisting and Standard Fastening Torque.

"Safety Precautions" mainly includes General Safety Precautions and Safety Measures To Be Taken Before And During Service Work.

"General Profile" includes the Assembly Diagram, Technical Specification, Component Weight and Oil Liquid List And Grease.

"Disassembling And Assembling" mainly describes the process and methods to be taken for machine components dismounting and assembly as well as the tools, lifting methods and precautions that should be taken during the process of dismounting and assembly of the machine.

"Test And Adjustment" mainly illustrates the practices and process on testing the machine components performance and machine technical data. This chapter will give helpful reference for maintaining the proper performance of the machine.

"Trouble And Trouble-Shooting Remedies" mainly describes the trouble phenomena, trouble causes, trouble diagnosis and trouble-shooting remedies. It also outlines the trouble diagnosis process by giving some examples of normal-seen troubles, which is very helpful to improve the service people qualification. The troubles, troubles causes and trouble-shooting remedies for some normal-seen problems are also listed in this chapter.

"Maintenance And Its Standards" mainly provides the machine operators with the illustration on the maintenance guidance and relative precautions for hydraulic system, electrical system and other working mechanism, as well as the special maintenance for the machine under the special working condition and maintenance standards (e.g: articulation holes, bearing clearance and torques, etc.), which is totally consisted of 3 parts.

"Attachment Specification And Wearing Parts List" mainly gives the models and specification of some other working attachments of the machine, and outlines the wearing parts list for specific 500 working hours, 1000 working hours, 1500 working hours and 2000 working hours.

"Basic Service Knowledge" mainly describes the basic knowledge of general service, and gives the some examples of service practices for welding seam, steel plate cracking, pin shafts, shaft sleeves and holes wearing as well hydraulic cylinders.

1. Preface



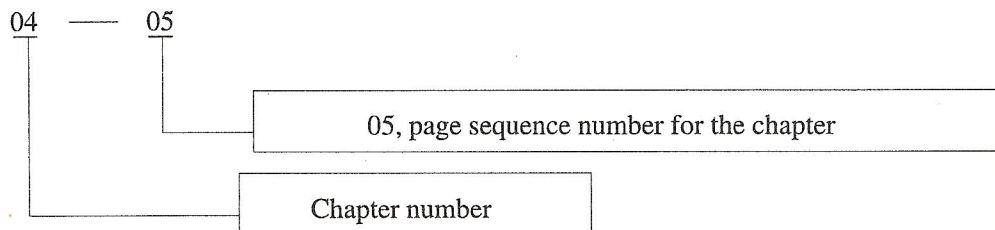
If you have any comment to this manual or good suggestion for improvement, please don't hesitate to contact us.

We will reserve the right to make improvement modification on the machine without giving prior notification.

1.2 How to Use This Manual

(1) Printing method: This manual is printed in the page sequence. The page number of this manual is shown at the bottom of each page.

(2) The following diagram shows how to read this manual.



(3) Adding pages: Behind the page number, it is shown with a mark of "(-)" and adding pages. Following is the example.

04-05

04-05-01

04-05-02

04-06

(4) Edition Modification Number

When it is needed to modify the current manual, edition number (1, 2, 3...) will be shown at the bottom of the cover page.

(5) All the modification or complimentary information will be sent to XCMG dealers. Before carrying out any work with this type of machines, please inquire the latest technical information about the machines from authorized XCMG dealers.

(6) Symbols

The symbols as shown in the table 01-01 will be used for highlighting the safety and quality instruction.

Table 01-01: Symbols

Symbols	Description	Notes
	Safety	Safety measures must be taken and followed during executing works.
	Caution	Technical precautionary measures or other service means must be taken during working.



1. Preface

	Weight	To show the weight of machine component or working system. Care should be taken when selecting hoisting ropes and operation methods.
	Fastening Torque	To show that the required fastening torque should be applied during the assembly.
	Coating	To show the area or points that need to be coated with sealing globe or grease.
	Water and oil	To show the working system that needs to be replenish with oil, water or fuel.
	Drainage	To show that water drainage or water drainage must be made at some parts of the machine.

1.3 Hoisting Instruction

! The heavy components (25kg plus) must be hoisted with crane machine. In the chapter of "Dismounting And Assembly", explicit marks are given for the machine parts with weight of 25kg or 25kg plus.

1. Hoisting

If a part of the machine could not be removed away by using a crane hook, then make the following checks:

- (1) Check to see if all the mounting bolts on the part have been removed away.
- (2) Check to see if there is any conflict between the part which is being removed away and other machine parts.

2. Steel Ropes

- (1) According to the weight of the part which needs to be hoisted, select the proper steel ropes.

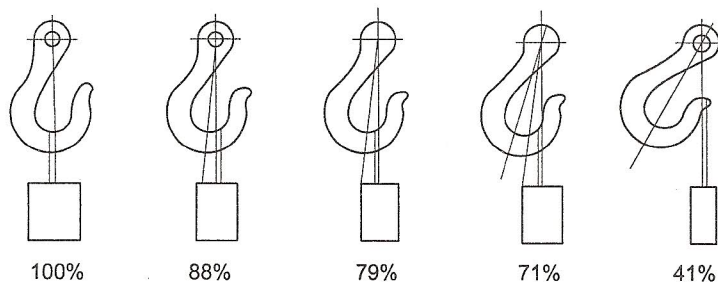
Steel Ropes (standard S-shape steel rope)	
Steel ropes diameter (mm)	Allowable loading capacity (t)
10	1.0
14	2.2
16	2.8
18	3.6
20	4.4
30	10.0
40	18.0
50	28.0
60	40.0

1. Preface



Note:

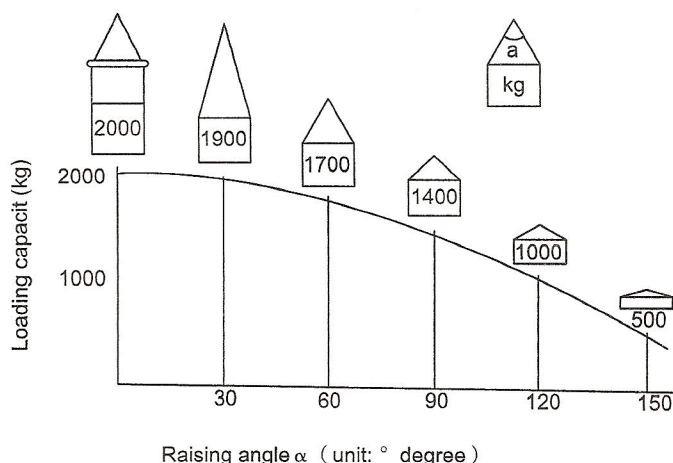
- (1) The allowable loading capacity as shown in the above table is estimated on the basis of 1/6-1/7 steel rope breaking strength.
- (2) The steel rope should be suspended in the middle of the hoisting hook. Otherwise, it will cause the risk of sever safety hazards if the steel rope is very near to the hook edge and possibly falls down from the hook. Bear it in mind that the most strong strength of the hook is at its middle.



- (3) It is recommended to use more than one steel rope when hoisting a machine part.

! To hoisting a machine part with only one steel rope could possibly have the part turn, steel rope get loose or slide away from the part during the process of hoisting, which will cause sever accident hazards.

- (4) Never let the steel ropes hoist a machine part in a large angle during hoisting. And please know that when hoisting the machine part with two or more steel ropes the loading force on each steel rope will be enlarged with the increasing of hoisting angle. The following diagram shows the changing allowable hoisting capacity of each steel ropes when hoisting a machine part with two steel ropes. In this example, the allowable hoisting weight of each steel rope is 1000kg. When the two steel ropes hoist a heavy staff in perpendicular angle, the total hoisting weight can be 2000kg. However, when hoisting a staff in an angle of 120° the maximum allowable hoisting weight can only be 1000kg. Let's we consider this issue from another point of view: if two steel ropes are used to hoist, in the angle of 150° , a heavy staff with weight of 2000kg, then the maximum loading capacity of each steel rope should be up to 4000kg.





1.4 Standard Fastening Torque

Standard Fasten Torque of Bolts And Nuts

Table 01-02 lists the standard fastening torque of mounting bolts and nuts. The special torque as stated in the chapter "Dismounting And Assembly" is not shown here.

Table 01-02: Standard Fastening Torque

Bolts thread diameter (mm)	Spanner open-idth (mm)	Fastening Torque	
		Kg.m	N.m
6	10	1.35 ± 0.15	13.2 ± 1.4
8	13	3.2 ± 0.3	31.4 ± 2.9
10	16	6.7 ± 0.7	65.7 ± 6.8
12	18	11.5 ± 1.0	112 ± 9.8
14	21	18.0 ± 2.0	177 ± 19
16	24	28.5 ± 3	279 ± 29
18	27	39 ± 4	383 ± 39
20	30	56 ± 6	549 ± 58
22	34	76 ± 8	745 ± 78
24	36	94.5 ± 10	927 ± 98
30	46	175 ± 20	1720 ± 190
33	50	225 ± 25	2210 ± 240
36	55	280 ± 30	2750 ± 290

Note:

(1) The fastening torques as listed in this table don't apply to the bolts with Nylon pads or other metal pads or other special bolts with designed fastening torques.

(2) $1\text{Kg.m} = 9.8\text{N.m}$

Fastening Torque for Separate Flange Mounting Bolts

The mounting bolts for separate flanges should adopt the fastening torques as listed in table 01-03.

Table 01-03: Fastening Torque

Bolts thread diameter (mm)	Spanner open-idth (mm)	Fastening Torque	
		Kg.m	N.m
10	16	6.7 ± 0.7	65.7 ± 6.8
12	18	11.5 ± 1.0	112 ± 9.8
14	21	18.0 ± 2.0	177 ± 19
16	24	28.5 ± 3	279 ± 29

2. Safety Notice



Safety

2.1 Safety Notice

Important safety notice:

Proper services are very important for safe operations of the machine!

In order to prevent personal injury, signals with  in this handbook represent safety measures which should be observed strictly; if dangerous situation occurs or may occur, safety should be considered first and take necessary preventive measures according to the real situation at the site.

2.2 General Safety Preventive Measures

Incorrect operations are very dangerous. Read the safety notice in the Service Handbook carefully before operating the machine.

- (1) Before lubricating or servicing, please read all the safety preventive measures specified on the tags and labels stuck or tied on the machine.
- (2) When doing any operations, safety shoes and helmet should be put on, loose work clothes or those with missing buttons should not be allowed. Besides:
 - Have the goggles on when hammering the parts.
 - Have the goggles on when grinding the parts.
- (3) If welding is necessary, only skillful welders after being trained are allowed to do it, and put on the welding gloves, goggles, helmets and proper welding clothes when welding.
- (4) When two or more workers are doing operations on the machine, consult the operation steps with each other before doing anything; let your partner know before you start any operation. Hang the label of "On Service" on the control lever in the cab before doing any operations or services.
- (5) Keep all tools in good condition, and learn how to use them correctly.
- (6) In the service workshop, a proper area should be specified for keeping tools and disassembled parts. Tools and parts should be stored in a right place, and the working site should be kept clean and no dust or oily dirt on the ground. Smoking is only allowed in specified area. No smoking when working.

2.3 Preparations

- (1) Before adding oil or doing services, stop the machine on a stable and horizontal ground, and put a wedge under the wheels in order to prevent the machine from moving.
- (2) Before doing services, lower the bucket or other distortional working apparatus to the ground. If being unable to do this, insert safety pins or fix on the service supporting apparatus so as to prevent the working apparatus from falling down which may cause accidents; meanwhile, make sure that all the control levers should be locked and hang the safety signs on them.
- (3) Support the machine with a heel block, jack or bracket before doing any dismantling or assembling.
- (4) Clear away all mud and oil on the ladder or other steps for getting on or down the machine; use the handrail, ladder or footplate for getting on or down the machine, do not allow jumping up or down the machine directly. If it is impossible to use a handrail, ladder or footplate, make a platform as a safe treadboard instead.

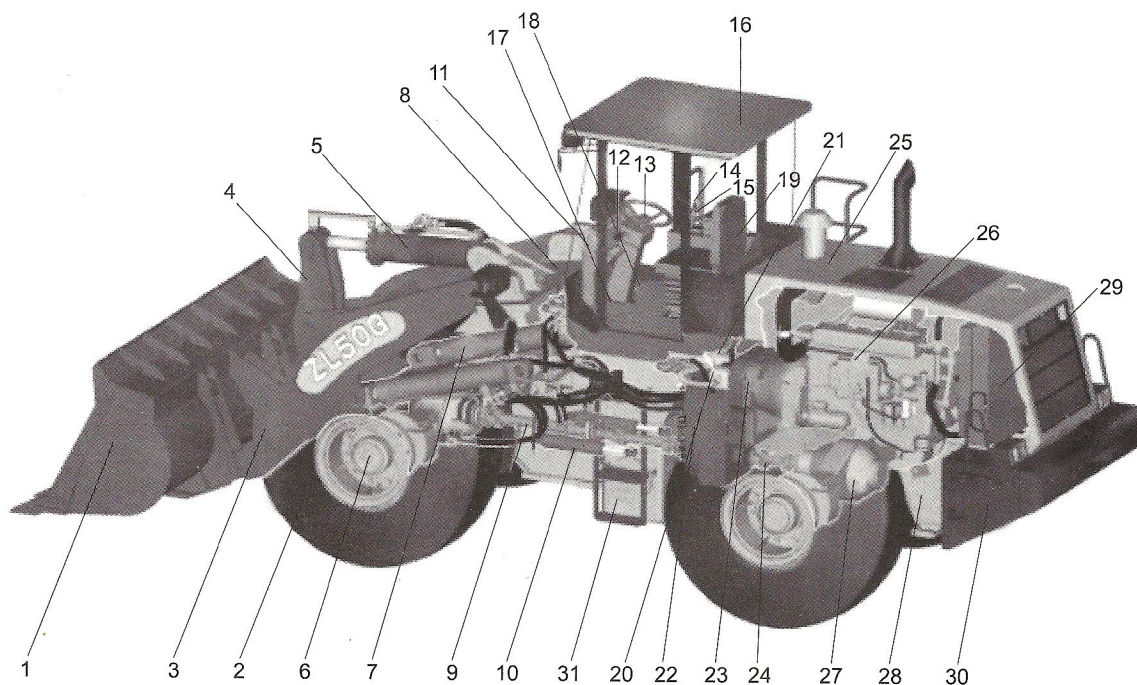


2.4 Safety Preventive Measures During Operating

- (1) Slowly loose oil caps, oil drainage plugs or plugs for measuring oil pressure at hydraulic mouthes in case oil may splash out; when dismantling the components of the oil, water or air pipelines, release pressure inside first.
- (2) When the engine is extinguished, water and oil inside of the pipelines are very hot, be careful not to be scalded. Only after the oil and water is getting cooled can service be made on the pipelines.
- (3) Disconnect wires from the battery cell before operating, wires on the negative pole should be always disconnected first.
- (4) Use a hoist or crane when lifting up heavy components. Check whether the steel wires, chains and lifting hooks are broken. Lifting equipment with enough capacity should be used. Place the lifting equipment at a correct position, and operate the hoist or crane slowly in case of colliding with other components. Do not work on any components which are lifted up by a hoist or crane.
- (5) When dismantling caps which are bearing the inside pressure or spring pressure, leave two bolts at the symmetrical position and release the pressure slowly, then loose the bolts slowly for dismantling.
- (6) When dismantling component units, be careful not to break off or damage the electrical wires which may cause electrical fire.
- (7) When dismantling pipelines, be careful not to sprinkle fuel or engine oil on the ground and wipe away if necessary. Any fuel or engine oil on the ground may cause you slip and fall and even a fire.
- (8) Normally do not use gasoline for cleaning components, especially for electrical components.
- (9) When assembling, make sure that all the components are assembled to their origianl position and change with new ones for those broken; special reminding is that when assembling hoses or wires, be careful not to collide with other components in case of lacerating or damaging.
- (10) Do not twist the high pressure hoses when assembling; broken hoses are very dangerous, so check carefully when assembling the high pressure return hoses; especially check whether the assemblies to the connecting components are correct.
- (11) Adopt required torque when assembling or fixing components with fasteners. Especially for assembling the safety protection components, such as protection shield and components which are severely shaking or high-speed rotating, check whether their assemblies are correct.
- (12) When aligning two holes, do not use your finger or hand, be careful not to insert your finger into holes.
- (13) When measuring the hydraulic pressure, check whether the measuring tools are precise first.

3. General Regulations

3.1 Assembly Drawing of the Machine (Fig. 03-01)



1. Bucket Assembly

2. Tyre

3. Boom

4. Rocker

5. Tilt Cylinder

6. Front Axle

7. Cylinder of Boom

8. Front Framework

9. Front Transmission Shaft

10. Steering Cylinder

11. Instrument Panel

12. Shift Selector

13. Steering Wheel

14. Control Lever of Boom Cylinder

15. Control Lever of Tilt Cylinder

16. Cab

17. Brake Pedal

18. Accelerator Pedal

19. Seat

20. Working Pump

21. Two-way Flow Pump of Leading
and Steering

22. Gearbox

23. Torque Converter

24. Rear Transmission Shaft

25. Hood

26. Engine Assembly

27. Rear Axle

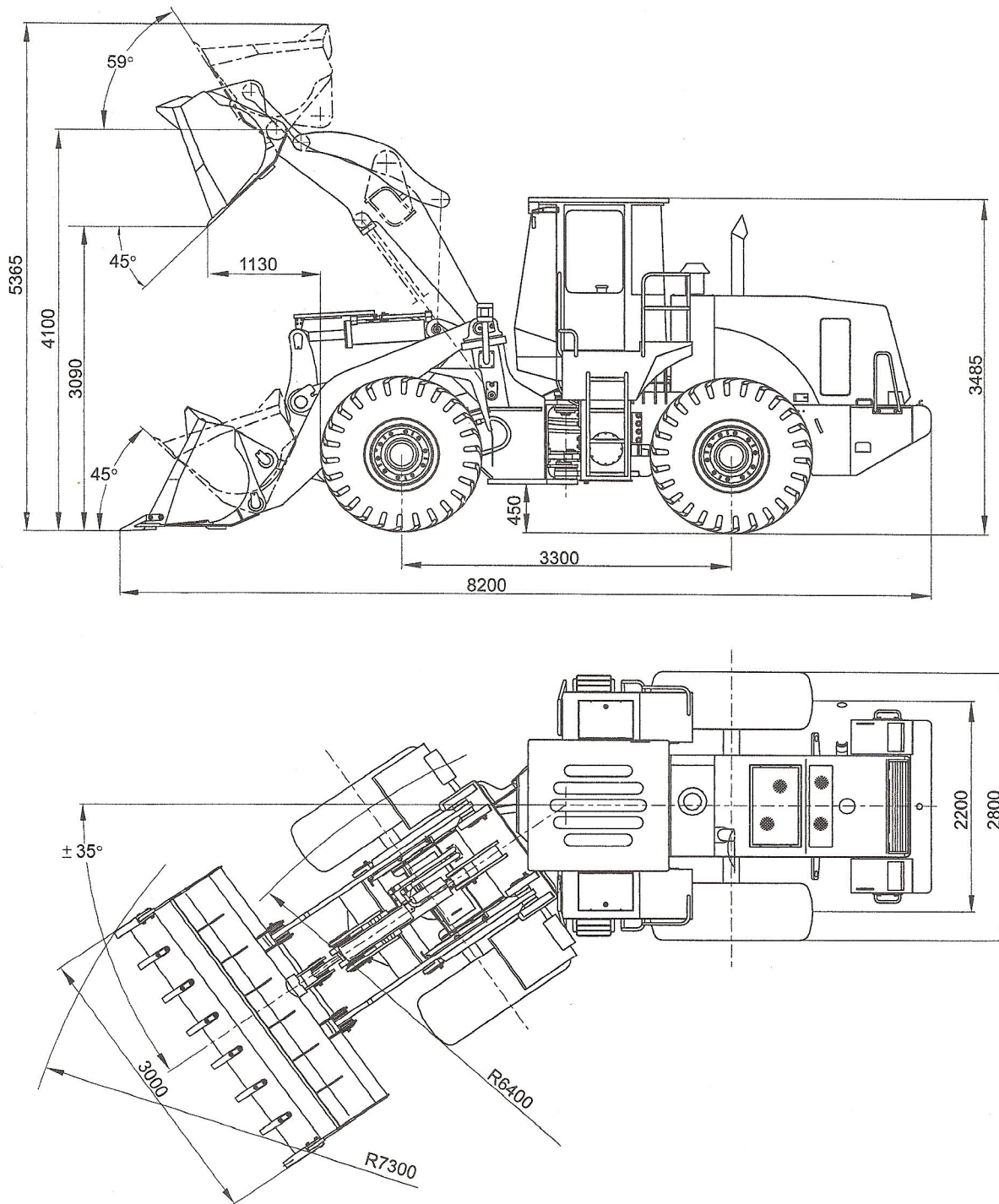
28. Rear Framework

29. Radiator Assembly

30. Counterweight

31. Hydraulic Oil Box

Assembly Drawing of the Machine (Fig. 03-02)



3.2 Specifications and Technical Data (Table 03-01)

Model			ZL50G		
Model	Type of working apparatus		Rock bucket	Standard bucket	Light material bucket
	Operating weight	(Kg)	175 000	175 000	175 000
	Distribution (front)	(Kg)	7 850	7 850	7 850
	Distribution (rear)	(Kg)	9 650	9 650	9 650
Feature	Bucket capacity (fully loaded) (m³)		2.5	3.0	3.5
	Rated load (Kg)		5 000	5 000	5 000
	Traveling speed				
	Forward 1st	(km/h)	6.5		
	Forward 2nd	(km/h)	11.0		
	Forward 3rd	(km/h)	24.0		
	Forward 4th	(km/h)	38.0		
	Reverse 1st	(km/h)	6.5		
	Reverse 2nd	(km/h)	11.0		
	Reverse 3rd	(km/h)	24.0		
	Max. gradeability	(deg)	28.0		
	Max. drawing force	(N/kg)	150 000 ± 5 000		
Dimension	Min. steering radius	At the center of outside tire (mm)	6 700		
		At the outside of the bucket (mm)	7 300		
	Overall length	(mm)	8 200		
	Overall width (chassis)	(mm)	2 800		
	Bucket width	(mm)	3 000		
	Overall height (roof of the cab)	(mm)	3 485		
	(Bucket at full lift)	(mm)	5 365		
	Wheel base	(mm)	3 300		
	Min. ground clearance	(mm)	450		
	Articulated pin height of bucket	(mm)	4 100		
	Dumping clearance (edge of bucket teeth)	(mm)	2 955		
	Dumping reach (edge of bucket teeth)	(mm)	1 205		
	Dumping angle of bucket	(deg)	45		
	Drawing back angle of bucket		49		
	(at conveying position)	(deg)			
	Digging depth (slope to 10 degree)	(mm)	50		

3. General Regulations



Model		ZL50G
Engine	Model: Type:	Cummins 6CTAA8.3-C 4-stroke water cooling direct injection, pressurized, air-to-air intercooling
	Number of cylinders- inner diameter X stroke(mm): Displacement (L):	6-114mm × 135mm 8.3
	Horsepower of flywheel (KW(PS)/rpm): Max. torque /rotate speed (N.m(kgm)/rpm): Rating fuel consumption (g/KW.h): High idle speed (rpm): Low idle speed (rpm):	153(205)/2 200 991(101)/1 400 ≤241 g/kW.h 2 460 850
	Start motor : AC generator: Storage battery:	24V 7.5KW 24V 50A 12V 120Ahx2
Power train	Torque converter: Gearbox: Type of main reducer: Type of hub reducer:	Single-stage, single-phase three-element Fixed shaft electro-hydraulic gear shifting spiral bevel gear single-stage reducing single-stage planetary reducing
Drive axleand wheels	Driving type: Front axle: Rear axle: Tyre: Inflating pressure: Front wheel (KPa) Rear wheel (KPa)	4-wheel driving Fixed with the machine body Swing type 23.5-25-16PR(L-3) No inner tube 23.5-25-20PR 310-340 280-310
Brake	Foot pedal: Parking brake: Brake pressure (KPa):	Single pedal, air pushing oil, clamp disc brake. Soft shaft control, energy is accumulated through spring, inner expanding shoe type. The brake is controlled though pushing the brake button. 686~784
Steering system	Type:	Articulated fully hydraulic flow amplified steering

3. General Regulations



Steering system	Max. steering angle (deg): Max. operating pressure (MPa):	Left or right 35 15
-----------------	--	------------------------

	Model		ZL50G
Hydraulic system	Type of hydraulic pump:		Gear pump
	Displacement (ml/r)	Working oil pump: Steering oil pump:	100 63
	Control valve	Max. operating pressure of working device (MPa) Max. pressure of steering system (MPa)	$p/kq/cm^2 \times 10.19$ 17.5 $p/162/po/p2 \times 145.004$ 15
	Hydraulic cylinder	Boom cylinder number-inner diameter $\times$ stroke(mm)	Reciprocating piston 2-160 $\times$ 840
		Bucket cylinder number-inner diameter $\times$ stroke(mm)	Reciprocating piston 1-200 $\times$ 585
		Steering cylinder number-inner diameter $\times$ stroke (mm)	Reciprocating piston 2-90 $\times$ 350
Working device	Type of connecting rod: Bucket:		Single connecting rod Bucket teeth
A/C system	Working medium of warm wind: Heating capacity: Working medium of cold wind: Refrigerating capacity: Working voltage:		Coolant of diesel engine 5000 kcal Refrigerant (R134a) 4000 kcal DC 24 V
Options	Rotating alarm lamp, triple valve, wood pliers, rock bucket, high dumping device, side tilting device		

3. General Regulations

**3.3 Table of Components Weight (Table 03-02)**

This table is only a reference for transportation or repairing and moving these components. (unit in the following table is kg/piece)

Model	ZL50G
Engine	617 (Cummins)
Torque converter and gearbox	425
Front transmission shaft	70
Rear transmission shaft	21
Front axle	1050
Rear axle	1096
Tyre	335
Rim	180
Working oil pump	37
Two-way flow pump of leading and steering	39
Multiple combined valve	62
Flow amplified valve	23
Tilt cylinder	250
Lift cylinder	178
Steering cylinder	25
Front framework	1800
Rear framework	1670
Rear mounting rack	216
Boom	1190
Rocker	346
Connecting rod	52
Bucket (2.5 m ³)	1375
Bucket (3 m ³)	1300
Bucket (3.5 m ³)	1350
Left trestle	80
Right trestle	100
Fuel tank	205
Hydraulic oil tank	140
Counterweight	1500
Front engine hood	90
Rear engine hood	150
Driver's cab	350 (Standard) 710 (FOPS & ROPS)



3. General Regulations

Seat	25
Storage battery	24.3
A/C evaporator	46
A/C condensator	30
A/C compressor	10.5
A/C compressor bracket	2
Radiator	200
Front differential	135
Rear differential	135
Front scrapper	23
Front framework pin of tilt cylinder	10
Front framework pin of boom cylinder	12
Front framework pin of boom	25

3.3.1 List of Oil, Water and Lubricant (Table 03-03)

Category	Name and grade		Filling amount of oil (water)	Parts and components for filling oil (water)
	Summer	Winter		
Fuel	0#、10# light diesel	-10#、35# light diesel	230 L	Fuel tank
Engine oil	Varieties:API CG-4/SG SAE 15W/40 engine oil		20 L	Engine oil sump
Gearbox oil	CF-4 15W/40 engine oil		50 L	Gearbox, torque converter
Hydraulic oil	L-HM46 (summer) L-HM32 (winter)		200 L	Hydraulic oil tank
Gear oil	GL-4 85W/90		Total 54 Lincluding: 27 L 27 L	Main transmission of driving axle and hub reducer Front axle Rear axle
Cooling system	Water		45 L	Water tank
Brake liquid	719 synthesized brake liquid		6kg	Oil cup
Lubricant	L-XACFA3 lithium grease(GB7631.8-90)		4 kg	Every articulated point and pin of working device, front framework, steering cylinder, center of framework and rear axle mounting bracket, cross shafts of every transmission shaft and spline, bearings of engine fan and water pump, and connecting points of every controlling knob.

3. General Regulations



3.3.2 Applicable Temperature for Different Grade of Oil (Table 03-04)

Category	Grade	Applicable Temperature (°C)	Remarks
Fuel	10# light diese		GB252-1994
	15# light diese	≥ 8	
	10# light diesel	≥ 4	
	-10# light diesel	≥ -5	
	-20# light diesel	≥ -14	
	-35# light diesel	≥ -29	
	-50# light diesel	≥ -44	
Engine oil	Viscosity grade 15W/40 engine oil	-20 to + 50	GB11122-1997
	Viscosity grade 10W/40 engine oil	-30 to + 50	
	Viscosity grade 10W/30 engine oil	-30 to + 40	
	Viscosity grade 5W/30 engine oil	-40 to + 40	

3.3.3 Special Reminding

- ① Other requirements, selecting principle and notes concerning oil grade for Cummins pressurized engine, ZF gearbox - torque converter and Meritor drive axle should be strictly observed according to the attached operation manuals of themselves; no lower grade of oil compared with those recommended in the operation manuals of engine, gearbox and driving axle should be selected in principle.
- ② When the sulfur content in the fuel is less than 0.5%, please refer to the specifications of periodic maintenance stated in the attached operation manual of the wheel loader and change the fuel at every time of periodic maintenance.

If the sulfur content in the fuel is more than 0.5%, please change it according to the following table:

Sulfur content in the fuel	Intervals for changing the fuel
0.5% to 1.0%	1/2 of the normal intervals
Higher than 1.0%	1/4 of the normal intervals

- ③ When starting the engine at the temperature lower than 0°C, make sure that SAE10W/30、SAE10W/40 and SAE15W/40 engine oil are used, even when the temperature goes up to around 10°C at daytime.
- ④ The filling amount is the total amount, which including the oil in this component and also the oil in every pipeline.
- ⑤ If the ambient temperature is lower than 0°C, anti-freeze should be added into the cooling system in time; meanwhile, cooling water should be drinkable because impure water may have lots of foreign matters which may cause blockage on the engine and the radiator, thus may decrease the radiating and lead oil temperature go up.

3. General Regulations



- ⑥ Under special geographical environment conditions, proper grade of oil should be selected according to the local air temperature; if the climate environment is very atrocious, some accessional protection devices are necessary, please contact with your local dealer of XCMG.
- ⑦ Xugong Science & Technology Co., Ltd. recommend our customers to use the hydraulic oil which is confected by Xugong and approved to be used on hydraulic components and equipment, and specially appropriative for Xugong's products.

Notes for symbols in the above table:

SAE: Society of Automotive Engineers.

API: American Petroleum Institute

4. Dismounting and Assembling



Using method of this handbook

1. Dismounting and assembling of components

(1) When dismounting or assembling of components, dismounting procedures and methods are available in this article, but no procedures for assembling.

(2) For example:

Dismounting XXXTitle of operation



XXXNotice related to safety when operating

1) **XXX**Operating procedure

2) **XXX**Operating procedure

△ XXXTitle of operation

Assembling of XXXTitle of operation

Procedures for assembling are quite opposite to those of dismounting.

△ XXXNotice when operating

3) General notices are provided for dismounting and assembling, meanwhile, notices for operation are also listed. When taking operation, it is a must to follow these notices

2. List of common tools

Names, specifications and amounts required for common tools during operation refer to the section of "List of common tools".

3. List of special tools

Names, specifications and amounts required for special tools during operation refer to the section of "List of special tools".

Notices when dismounting

When dismounting and assembling of the system or the components, the following notices should be observed.

1. Notices when dismounting components from the wheel loader:

- Lift equipment with enough strength is needed for lifting the components;
- A container with proper capacity should be prepared when draining out the lubricants or fuel;
- If the coolant has anti-freeze in it, dispose it properly;;
- When dismounting hoses or hard pipes, seal the mouths of these pipes to prevent any dirt or dusts coming in;
- Tie labels on dismantled wires and hoses and explain their assembling position so as to prevent mistakes when re-assembling;
- Before dismantling any components from the wheel loader, set matching signs at necessary places so as to prevent mistakes when re-assembling;

4. Dismounting and Assembling



- When dismounting strengthful bolts of any component, it is necessary to loose the bolts alternately;
- Check the amount and thickness of the adjusting pads and keep them in a safe place;
- Before dismounting any component, clean the place where you would lay it on; and fix a protection cover on the component so as to prevent dirt and dust may come inside;
- When lifting any component, lifting equipment with enough strength should be adopted.

2. Notices when assembling:

- Tighten all bolts and nuts to specified tight moment;
- Distortion or interference is not allowed for assembling of hoses;
- Change all sealing pads, O-rings, split pins and locking washers;
- Bend split pins and locking washers carefully and assemble them properly;
- After assembling of split rings, check whether they are firmly fixed in the slot or not;
- When tightening the separate flange, tighten from both sides alternately in case of one side is over tightened;
- When it is necessary to daub agglutinants, clean the component first to clear away all the oil and lubricant on its surface and then daub 2~3 drops of agglutinants on the screw thread;
- When it is necessary to daub sealing glue on washers, clean the surface of the component and clear away all oil and lubricant, and then daub sealing glue on it evenly;
- When connecting plugs of wires, clean the plugs first to clear away all the oil, dust and water, and then connecting them firmly;
- Daub lubricants on the rotating parts and gliding parts;
- All the assembling parts should be cleaned and all the broken parts should be repaired;
- When using fly ring bolts, check whether they are distorting or broken, tighten them with screws and then align them with the lifting hook;

△ After re-assembling of the repaired cylinder, the air inside of it should be drained away according to the following method at the first time of operation:

- (1) Start the engine and run it at low speed and in neutral gear;
- (2) Use the control lever of the working device to make the hydraulic oil cylinder act for 4~5 times and stop at the 100 cm to the end of the stroke;
- (3) Then make the cylinders of steering, bucket and boom act for 3~4 times to the end of the stroke;
- (4) Increase the speed of the engine, and repeat the procedure of 3) to drain away the air for several times until there is no air coming out from the draining plug;
- (5) After finishing the above procedures, run the engine at the normal speed.

△ After repair of the loader, or at the first time of re-operation after not being used for a long time, the hydraulic equipment should be drained out of air according to the above procedures as well.

3. Notices after assembling:

- If the coolant has already been drained away, tighten the drainage valve first, fill water to the specified level, run the engine to circulate the water in the system and then check the water level again;



4. Dismounting and Assembling

- If the hydraulic component is re-assembled after being dismounted, the hydraulic oil should be filled to the specified level, run the engine to circulate the oil in the system and then check the oil level again;
- If pipes or hydraulic components (such as hydraulic oil cylinder, pump or motor) are dismounted for repair, they should be drained out of air after being re-assembled;
- Add lubricants with specified amount at the lubricating points of the working device and every articulating joint.

List of common tools

No.	Name	Specifications	Quantity
1	Split spanners	12 pieces/set	1 set
2	Double offset ring spanner	8 pieces/set	1 set
3	Adjustable spanners	30 × 250 (10")	1
4	Adjustable spanners	55 × 450 (18")	1
5	Screw driver	150 × 7 (6")	1
6	Screw driver	300 × 9 (12")	1
7	Hammer	1kg	1
8	Slip-joint pliers	200 (8")	1
9	Grease gun	400ml	1
10	Tyre barometer	0~0.8MPa	1

List of special tools

No.	Name	Quantity	Remarks
1	Pinch bar	1	
2	Box spanner	1	For axle
3	Box spanner	1	For axle

Dismounting of rear hood unit

 Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

 Cut off the power from the negative pole of the battery cell.

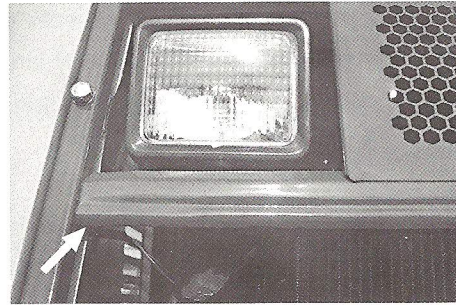
1. Rear blocking hood

- (1) Cut off the socket connector of the rear large light;

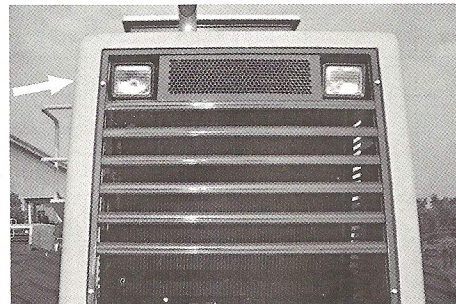
4. Dismounting and Assembling



- (2) Loose the nut for fixing the rear light, and then take down the rear large light;

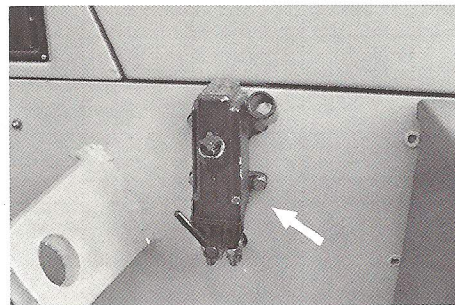


- (3) Take down the assembling bolts and then the rear blocking hood.

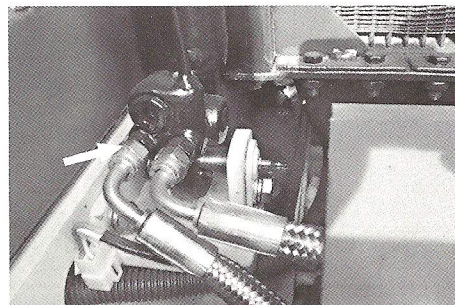


2. Lift device

- (1) Put the direction control handle of oil pump at ↓ and take down the two hoses which connected with oil pump. Drain out all the hydraulic oil in oil pump and pipes.

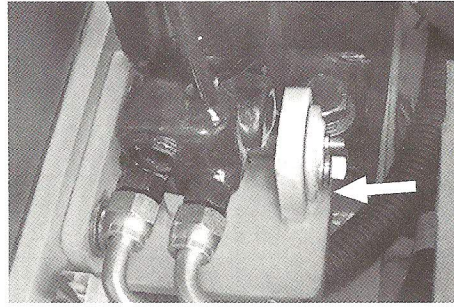
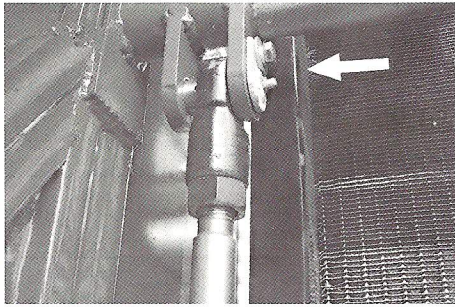


- (2) Take down the two hoses connected with lift cylinder.



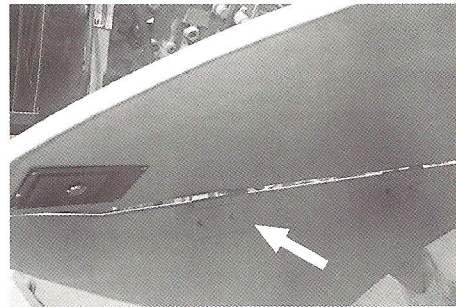
4. Dismounting and Assembling

- (3) Take down the fixing bolt of upper and lower articulation pin of lift cylinder, pull out the articulation pin and take down the lift cylinder.

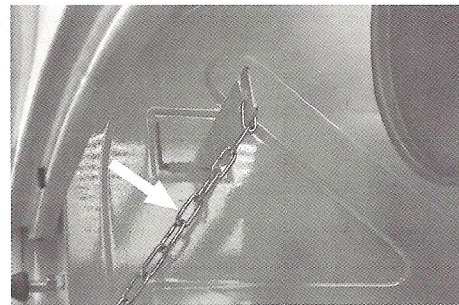


3. Side door

- (1) Take down the assembly bolts for connecting the left and right side doors with the framework;

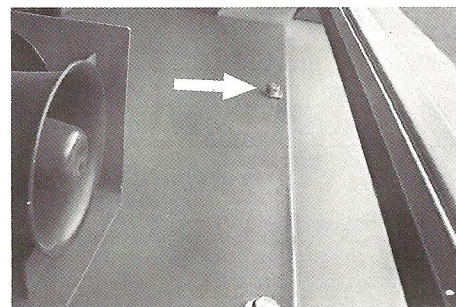


- (2) Take down the chain and then the side doors.



4. Rear hood

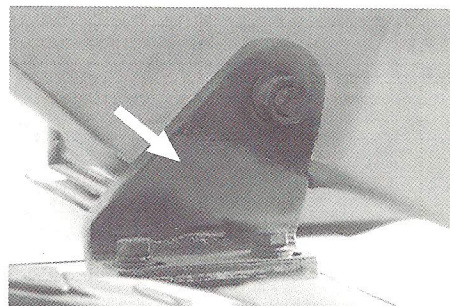
- (1) Take down the assembly bolts for fuel tank cover, cut off the wires of bugle and take down the fuel tank cover.



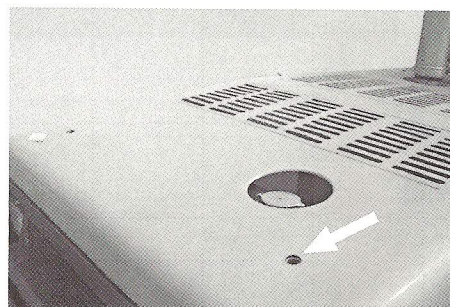
4. Dismounting and Assembling



- (2) Take down the assembly bolts for connecting the brackets of the rear hood with the framework;



- (3) Cross nylon rope over the lifting bolt, and then connect with the lifting chains to hang the hood away from the machine.



 Rear hood unit of the engine:105kg

- △ When using lifting bolts for hanging the engine rear hood, the dimension of the screw thread is M20.

Assembling of the rear hood unit

Adopt the opposite sequences of dismounting for assembling.

- △ When assembling the rear hood, add a little of grease at the inside holes of the left and right brackets, and fix the bearing to the inside hole, then coat the inside and outside of the bearing with enough grease (marker of the bearing is outward).
- △ When assembling the lift device, add grease at both the up and down pins.

Dismounting the front hood

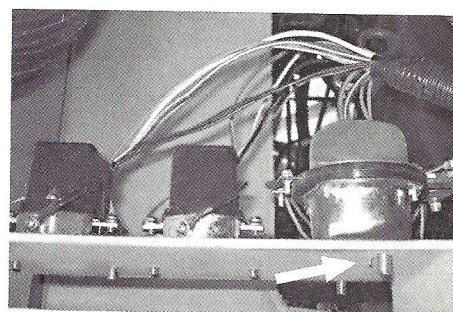
1. Main switch of the power and start-up relay

- (1) Cut off the socket connectors of the main power switch and start-up relay;

4. Dismounting and Assembling



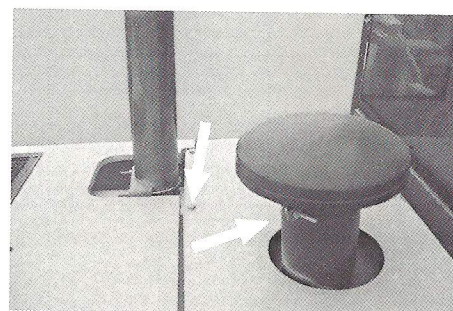
- (2) Take down the assembling bolts and then the main power switch and start-up relay.



2. Air filter

- (1) Loose the hoop for fixing the water proof cap, and then take down the water proof cap;

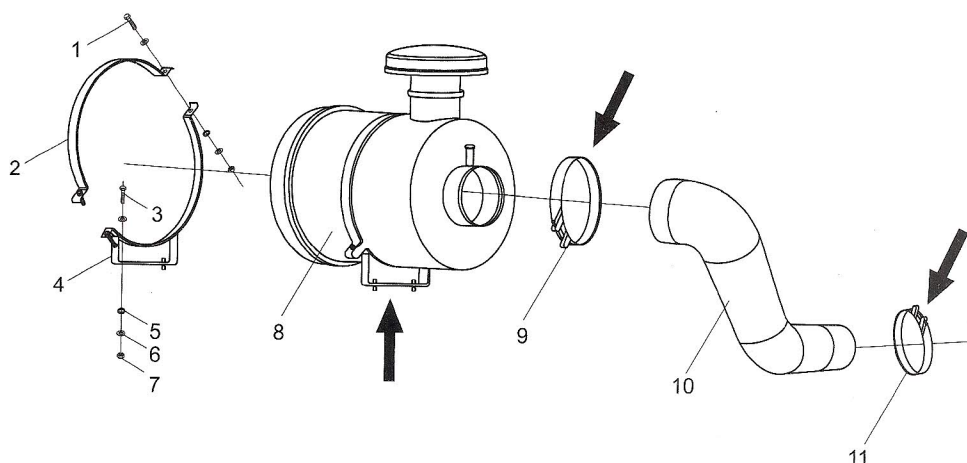
- (2) Loose the fixing bolts on the cover plate of the front hood, and then take down the cover plate;



- (3) Loose the T-hoop for connecting the air inlet pipe with the inlet port of the engine(Ø112)

The following steps should be done after the front hood is lifted away from the machine.

- (4) Loose the T-hoop for connecting the air filter(Ø165), and then take down the air inlet pipe;
(5) Loose the bolts on the bracket of the air filter(M8 × 50)and those for fixing the bracket(M8 × 25).
(6) Take down the air filter.



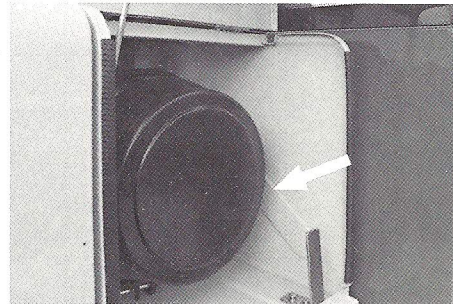
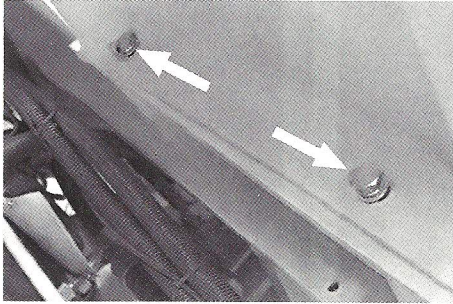
4. Dismounting and Assembling



3. Front hood

- (1) Loose the bolts for connecting the front hood and the framework;
- (2) Cross a nylon rope over the front hood, and connect to the lifting chains, then hang the hood away from the machine.

 Front hood unit of the engine: 45kg.



Assembling of the front hood unit

Adopt the opposite sequences of dismounting for assembling.

Dismounting of the radiator unit

 Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

 Release the remnant pressure inside of the pipes.

Lift up the front part of the bucket for 30~50mm and down the rear part to the ground by operating the knob, and then stop the engine.

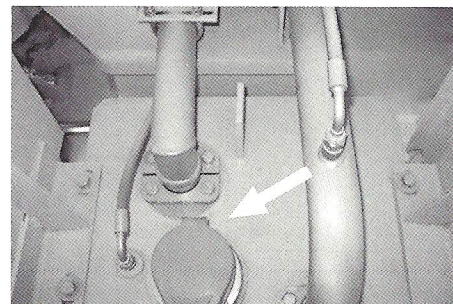
Then check whether the whole underside of the bucket touch the ground or not.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

 Cut off the power from the negative pole of the battery cell.

1. Cap

Loose the cap of the hydraulic oil tank slowly to release the inside pressure in case of any oil may come out.



4. Dismounting and Assembling

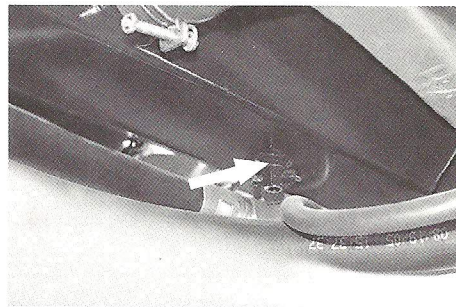


2. Water drainage

Loose the water drainage valve to drain away the coolant.

△ If the coolant has anti-freeze in it, proper dispose of it.

 Coolant: 45L.



3. Hydraulic oil drainage

Loose the drainage valve of the hydraulic oil radiator to drain the hydraulic oil.

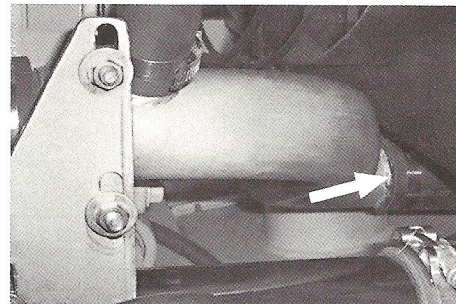
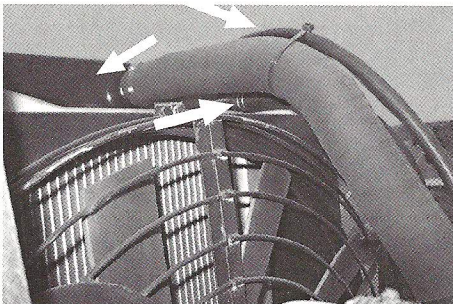
Loose the drainage valve of the gearbox radiator to drain the hydraulic oil.

4. Hoses of water tank radiator

(1) Disconnect the hoses for linking the upside of the water tank radiator with the engine (three pieces, respectively are permeability hose of the engine, up water hose and water filling hose);

(2) Disconnect the hoses for linking the downside of the water tank radiator with the engine (down water hose).

△ In order to prevent water leaking from the water tank, bend the end of the hose and tie up with a belt.



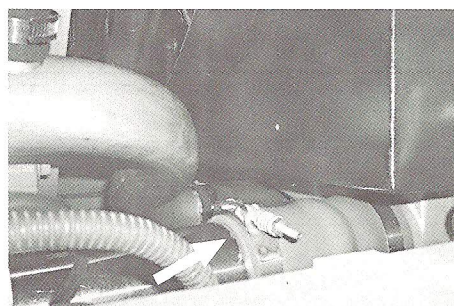
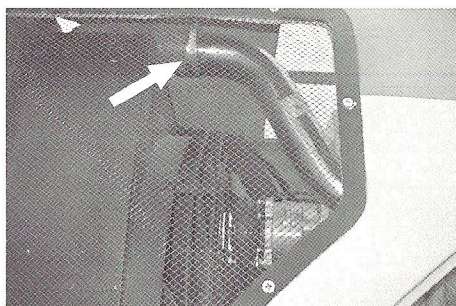
5. Hoses of intercooler

(1) Disconnect the hoses for linking the upside of the intercooler with the engine (air inlet hose of the intercooler);

(2) Disconnect the hoses for linking the downside of the intercooler with the engine (air outlet hose of the intercooler).

△ The end of the hoses should be covered in case water or dust may come inside.

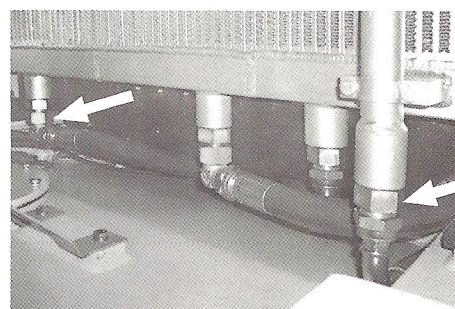
4. Dismounting and Assembling



6. Hoses of the gearbox radiator

Disconnect the hoses for linking the gearbox radiator with the gearbox (two pieces: oil inlet hose and outlet hose);

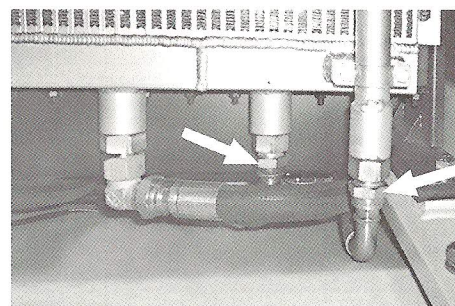
- △ The end of the hoses should be covered in case water or dusty come inside.



7. Hoses of hydraulic oil radiator

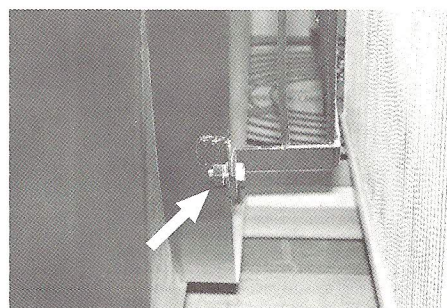
Disconnect the hoses for linking the hydraulic oil radiator with the hydraulic oil tank (two pieces: oil inlet hose and outlet hose);

- △ The end of the hoses should be covered in case water or dust may come inside.



8. Cover of the fan

Loose the bolts for connecting the fan cover and the windshied and then take down the fan cover.



4. Dismounting and Assembling



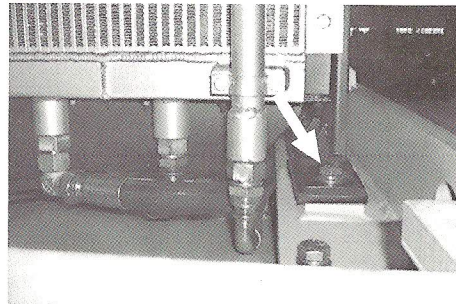
9. Radiator

Take down the assembling bolts for connecting the radiator and the framework and lift the radiator away.



Radiator unit: 200kg.

- △ When taking down the radiator, please note that the radiator-fans should not be damaged.



Assembling of the radiator unit

Adopt the opposite sequences of dismounting for assembling.

- △ Run the engine to circulate the water in the system and then check the water level.
- △ When fixing hoses, it is not allowed to distort or enwind these hoses.
- △ Be careful, do not damage the radiator-fans. When fixing, the distance between the fan and the radiator should be well-proportioned. Fully tighten the bolts for fixing the radiator.

1. Re-filling with oil

- (1) Fill oil to the required level through the filler for the gearbox.
 - △ Run the engine to circulate the oil in the system and check the level again.
- (2) Fill oil to the required level for the hydraulic oil tank.

Dismounting of the combination (engine, gearbox and torque converter)

- ⚠ Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

- ⚠ Release the remnant pressure inside of the pipelines.

Lift up the front part of the bucket for 30~50mm and down the rear part to the ground by operating the knob, and then stop the engine.

Then check whether the whole underside of the bucket touches the ground or not.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operate the knob for several times to release the remnant pressure in the hydraulic pipelines.

- ⚠ Cut off the power from the negative pole of the battery cell.

1. A/C compressor unit

Take down the A/C compressor.

Please refer to the section of "Dismounting of A/C compressor" for details.

2. Radiator unit

Take down the radiator unit.

Please refer to the section of "Dismounting of radiator unit" for details.

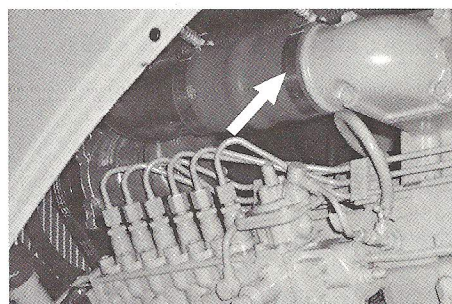
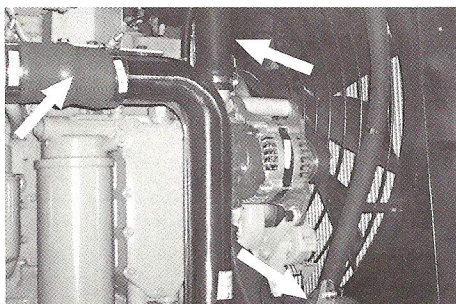
3. Driver cab

Take down the driver cab.

Please refer to the section of "Dismounting of driver cab" for details.

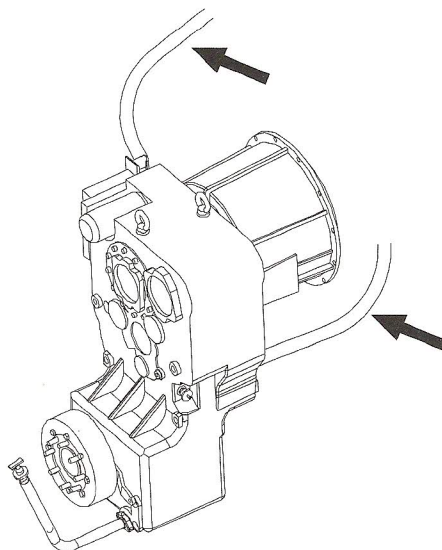
4. Hoses for connecting the water tank and intercooler with the engine

- (1) Disconnect and take down the hoses for linking the end of engine with the radiator of the water tank (permeability hose of the engine, up water hose, down water hose and water filling hose);
- (2) Disconnect and take down the hoses for linking the engine with the intercooler (air inlet hose and outlet hose).



5. Hoses of hydraulic oil

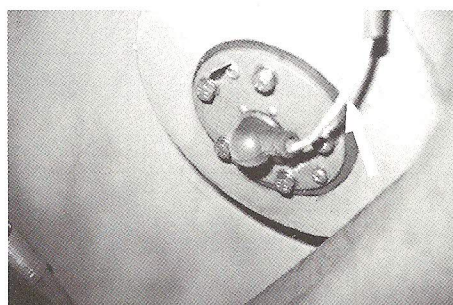
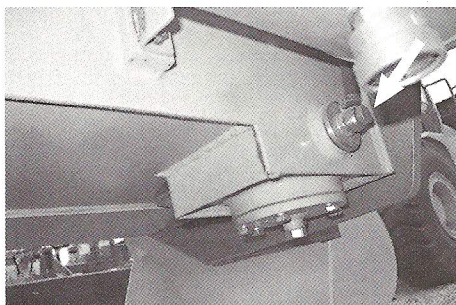
Disconnect and take down the hoses for linking the gearbox with its radiator (oil inlet hose and outlet hose);



4. Dismounting and Assembling

6. Fuel hoses

- (1) Disconnect the fuel hoses from the end of the fuel tank (oil inlet hose and outlet hose);
- (2) Disconnect the wire linker of the level sensor of the fuel tank.

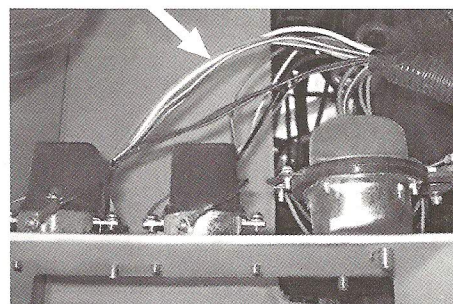


7. Wires

Disconnect the follow wires.

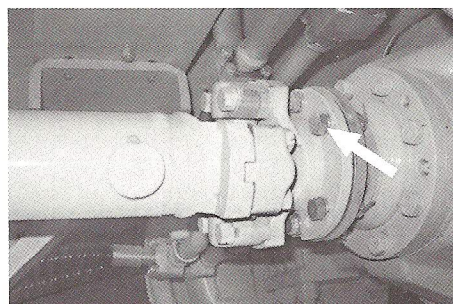
△ When disconnecting wires, please tie labels on them for future identification.

- (1) Disconnect wires from the main power switch and the start-up relay;
- (2) Disconnect cables from the end of the start-up motor;
- (3) Disconnect wires from the sensor of the gearbox.



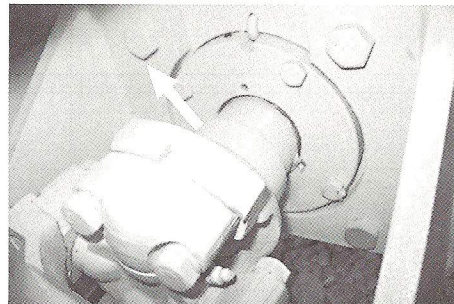
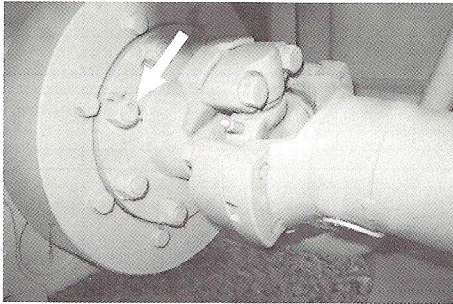
8. Front and rear transmission shafts

Loose the bolts for connecting the front transmission shaft and the front axle;

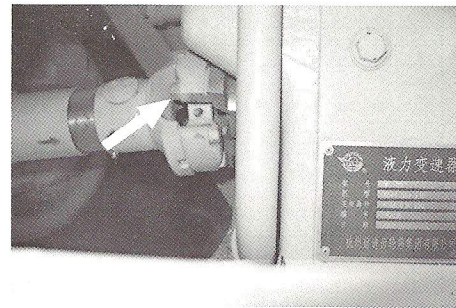


Loose the bolts for connecting the middle transmission shaft and the gearbox and those for fixing the axle bracket, and then take down the front and middle transmission shafts;

4. Dismounting and Assembling



Loose the bolts for connecting the rear transmission shaft, the rear axle and the gearbox, and then take down the front and rear transmission shafts;



△ Make matching signs to indicate the assembly position.

 Front transmission shaft unit (front and middle transmission shafts): 70kg.

 Rear transmission shaft: 21kg.

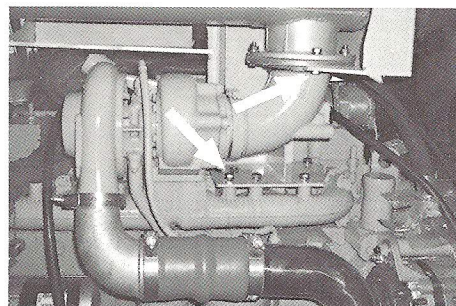
9. Air filter unit

Take down the air filter unit.

Please refer to the section of "Dismounting of the front hood" for details

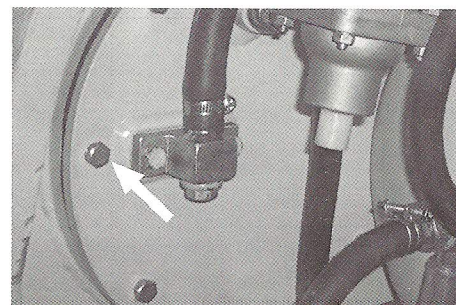
10. Silencer unit

Take down the hoop and bolts for connecting with the turbocharger, and then lift up the silencer.



11. Oil draining pipeline of engine

Take down the bolts for fixing the connector of oil draining pipeline of engine.

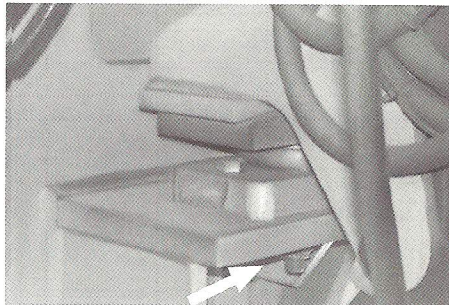
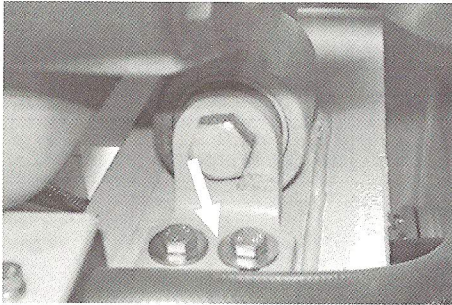


4. Dismounting and Assembling



12. Combination of the engine, the torque convertor and the gearbox

- 1) Use special lifting tools to lift up this combination, and then take down the assembling bolts of both sides.



- △ Keep this combination at a horizontal status when lifting it up.
- △ Check the assembling method of the shock pads and liners of the engine and the gearbox for reference when re-assembling.

- 2) Keep this combination at a horizontal status after taking down all the bolts, and move it backwards for around 30mm, and then lift it away from the machine.

- △ Check if the engine unit is blocked by any other objects when lifting it up.

 Engine unit: 617kg (Cummins Engine)

Torque convertor and gearbox: 425kg.

Assembling of the combination (engine, gearbox and torque convertor)

Adopt the opposite sequences of dismounting for assembling

1. Assembling of the A/C compressor

Please refer to the section of "Assembling of the A/C compressor" for details.

2. Assembling of the radiator unit

Please refer to the section of "Assembling of the radiator unit" for details.

3. Assembling of the driver cab

Please refer to the section of "Assembling of the driver cab" for details.

4. Connect the wires and the socket connectors of the electrical equipment firmly.

4. Dismounting and Assembling



5. Connect the hoses and oil pipelines based on their labels.

- △ When connecting the transmission shafts, clean the surface of the cross joints and the couplings, and then fix them on after well engaged.

Re-filling with oil

- 1) Fill hydraulic oil to the required level for the hydraulic oil tank;
- 2) Fill oil to the required level through the filler for the gearbox. Run the engine to circulate the oil in the system and then check the oil level again.

Dismounting of the front axle unit

- ⚠ Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the connecting rod to lock the front and rear frameworks. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

- ⚠ Release the remnant pressure inside of the pipelines.

Turn on the power and step the brake pedal slowly and continuously until the brake pressure give out alarm, then turn off the power. Loose the exhaust bolts on the front and rear brake to release the brake oil pressure.

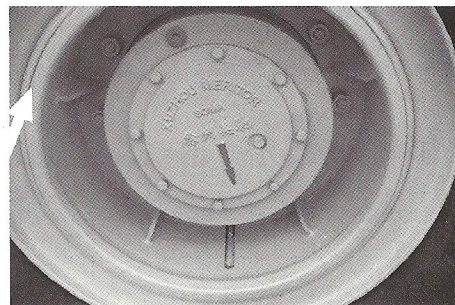
- ⚠ Cut off the power from the negative pole of the battery cell.

Use a jack to lift up the axle, and place a wood under the front framework.

1. Tyres and wheels

Lift and hold the left and right tyres and rims, dismount the nuts, and then take them down.

 Tyres and rims: 535kg (23.5-25 tyre)



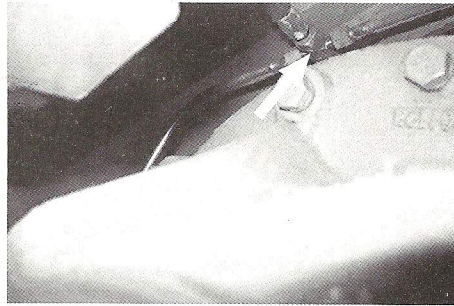
2. Transmission shaft

Please refer to the section of "Dismounting of the combination" for details.

4. Dismounting and Assembling

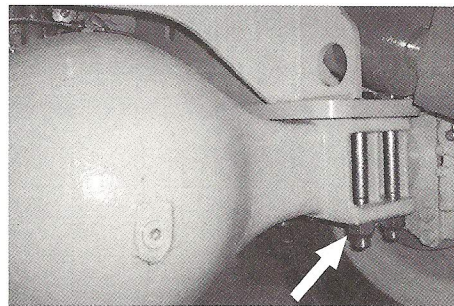
3. Brake pipelines

- (1) Dismount the cover at the front framework and then the brake pipes between the brake valve and the T-connector;
 - (2) Dismount the brake pipe between the T-connector to the left and right wheels.
- △ Insert a plug to the pipe in case of any dust or dirt may come inside after dismounting.



4. Front axle

- (1) Lift and hold one end of the front axle shell, and place a jack under the other end.
 - (2) Place a jack under the differential.
 - (3) Dismounting the bolts, keep its balance by using crane and jack, and then lift it away.
- △ Be careful, do not let the T-connector at the bottom of the axle shell touch the framework.
-  Front axle: 1050kg.
- (4) Pull out the front axle from the underside of the framework.



Assembling of the front axle unit

Adopt the opposite sequences of dismounting for assembling.

- △ Drain out air from the brake oil pipeline and make brake testing.
- △ Fill oil to the required level through the filler for the hydraulic oil tank.

Dismounting of the rear axle unit

-  Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the connecting rod to lock the front and rear frameworks. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.
-  Release the remnant pressure inside of the pipelines.
Turn on the power and step the brake pedal slowly and continuously until the brake pressure give out alarm, then turn off the power. Loose the exhaust bolts on the front and rear brake to release the brake oil pressure.
-  Cut off the power from the negative pole of the battery cell.
Use a jack to lift up the axle, and place a wood under the front framework.

4. Dismounting and Assembling

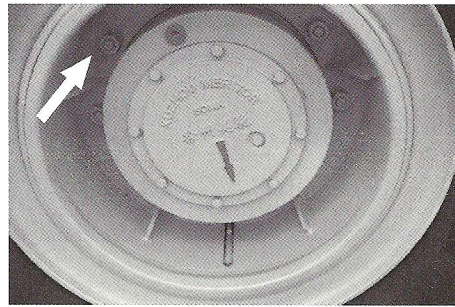


1. Tyres and wheels

Lift and hold the left and right tyres and rims, dismount the nuts, and then take them down.



Tyres and rims: 535kg (23.5-25 tyre)

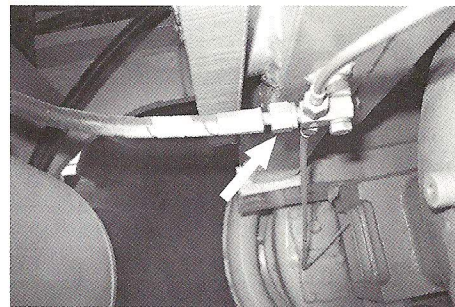


2. Transmission shaft

Please refer to the section of "Dismounting of the combination" for details.

3. Brake pipelines

- (1) Dismount the brake pipeline between the boost pump and the T-connector;
 - (2) Dismount the brake pipe between the T-connector to the left and right wheels.
- △ Insert a plug to the pipe in case of any dust or dirt may come inside after dismounting.

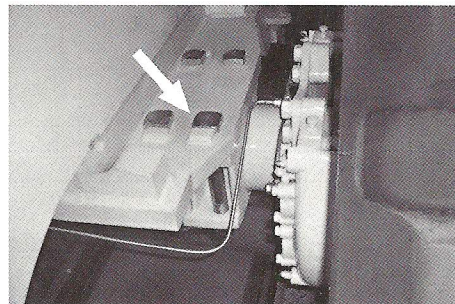


4. Grease pipeline

Dismount the grease pipeline from the assembly bracket of the rear axle.

5. Rear axle and the assembly bracket

- (1) Fix the assembly bracket and the rear axle by chains;
 - (2) Dismount the left and right bolts;
- △  Rear axle: 1065kg
- (3) Pull out the rear axle and the assembly bracket together from the chassis and then put them down
- △ Keep its balance when putting down the rear axle.



Assembling of the rear axle unit

Adopt the opposite sequences of dismounting for assembling.

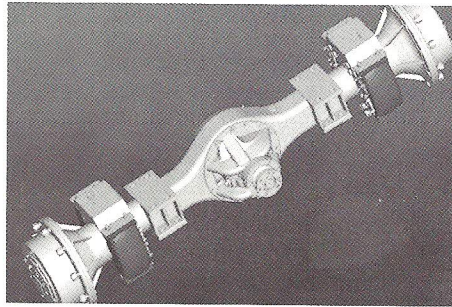
- △ Assemble the rear axle first, and then the fuel tank.

Please refer to the section of "Assembling of the fuel tank" for details.

- △ O-rings and liners should be new ones.
- △ Drain out air from the brake oil pipeline and make brake testing.

Dismounting and assembling of C216NZS-1、C216NZT-1 axle

1. Dismounting and disassembling



Note:

- (1) Take protection when dismount and disassemble. The protection includes glove, protecting shoe and glasses.
- (2) Don't dismount the screw and fasten by cold chisel and hammer.

Warning

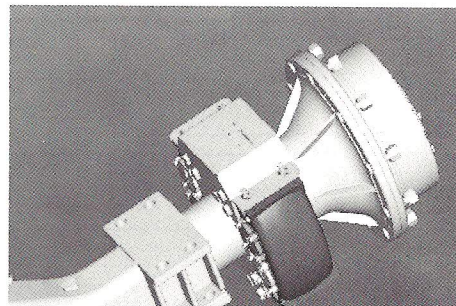
- (1) Part and person may be damaged and injured caused by dismounting the screw fasten by cold chisel and hammer.
- (2) Support the drive axle firmly before dismounting, which can prevent part damaging and personal injury caused by axle sliding and tilting.

Discharge the lubrication oil from axle

- (1) The oil discharging should be done just after the machine stops working and the machine still has high temperature.
- (2) Discharge the oil from the two rim reducers of axle and main reducer located on the middle of axle.
- (3) Release the air pressure inside the axle before oil discharging. The air releasing can be done through dismounting the air plug.

1.1 Dismounting of the brake clamp

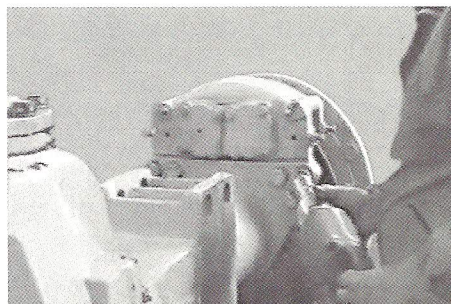
- (1) Unscrew off the bolts for fastening the anti-dust cover of brake clamp and take down the anti-dust cover of brake clamp. (This item is specially point to C216NZS-1 axle.)



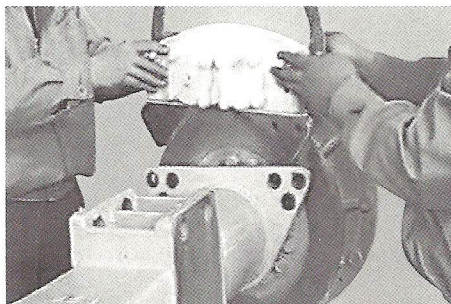
4. Dismounting and Assembling



- (2) Unscrew off the bolts for fastening the anti-dust cover of brake clamp.



- (3) Take down the brake clamp.



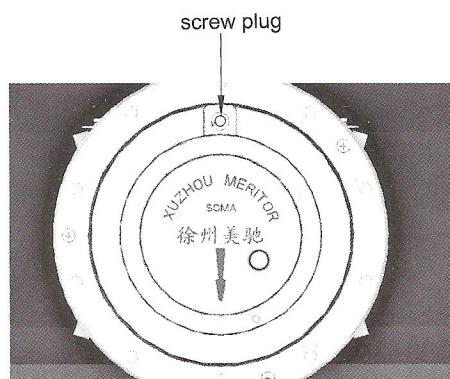
1.2 Dismounting of the rim reducer

1.2.1 Dismounting of side cover, half shaft and sun wheel

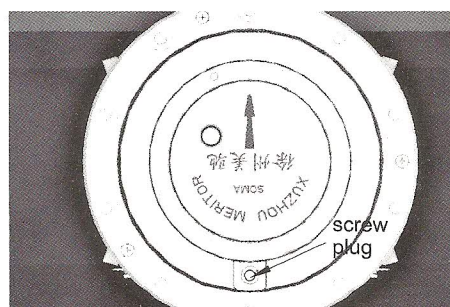
- (1) Unscrew off the upper plug on the end side of rim reducer to release the air pressure inside the drive axle, then screw the plug again.

Note:

If discharge oil without releasing the air pressure, the oil will spout out.



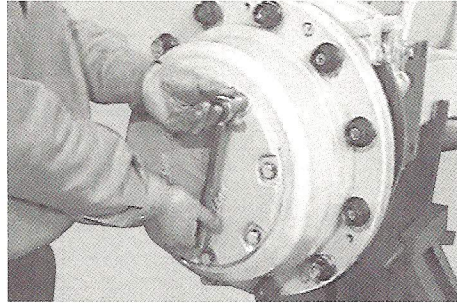
- (2) Unscrew off the lower drain plug to discharge oil.



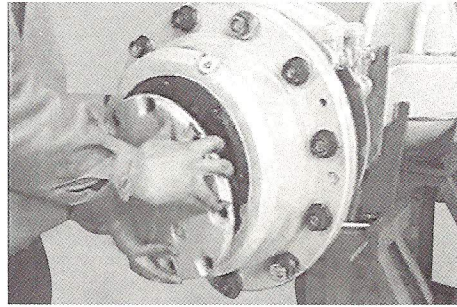
4. Dismounting and Assembling



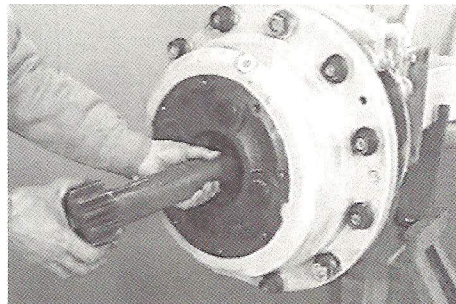
(3) Take down the bolts for fastening the rim end cover.



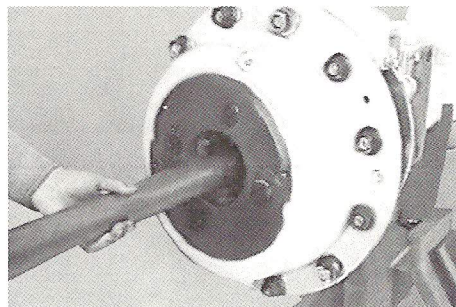
(4) Take down the rim end cover.



(5) Take down the ring from the half shaft, then take down the sun wheel.

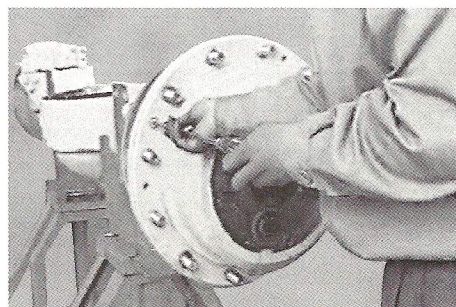


(6) Take out the half shaft.



1.2.2 Dismounting of planetary wheel bracket

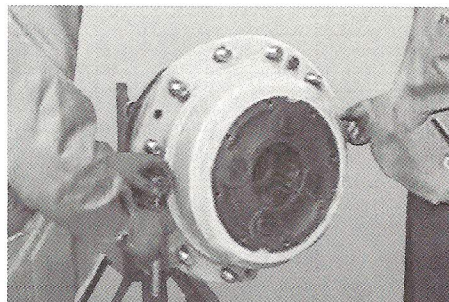
(1) Take down the three bolts for fastening the planetary wheel bracket.



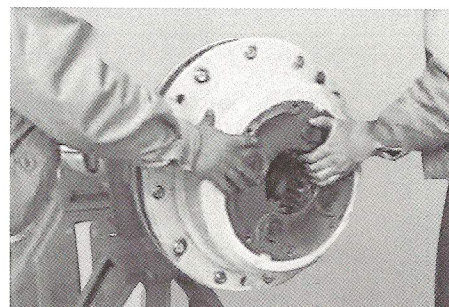
4. Dismounting and Assembling



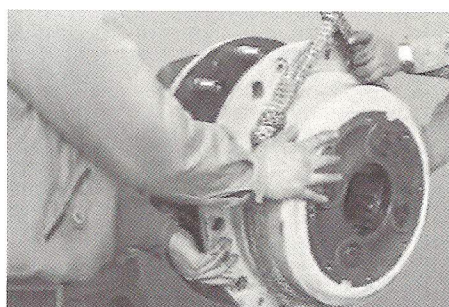
- (2) Screw the M16 bolts into the two screw holes on the planetary wheel bracket to push out the planetary wheel bracket, and the orientation hole should disengage.



- (3) Screw the M16 bolts into the two screw holes on the planetary wheel bracket to disengage the orientation hole between planetary wheel bracket and hub.

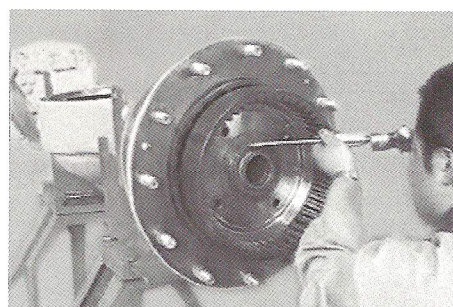


- (4) Fasten the planetary wheel bracket by safety belt and lift it away from rim.

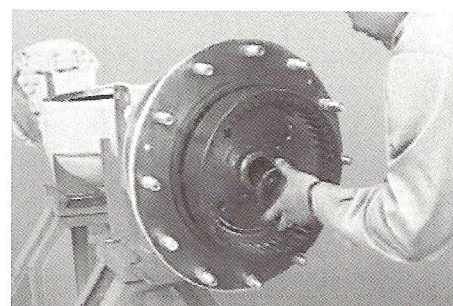


1.2.3 Dismounting of hub

- (1) Open the safety for retainer of lock nut by hammer and screw.



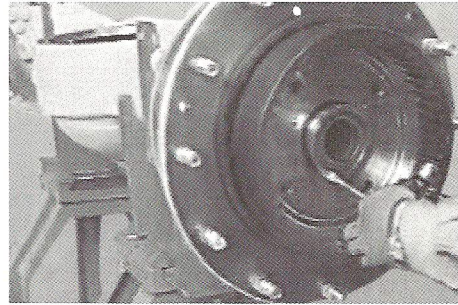
- (2) Take down the lock nut and retainer washer.



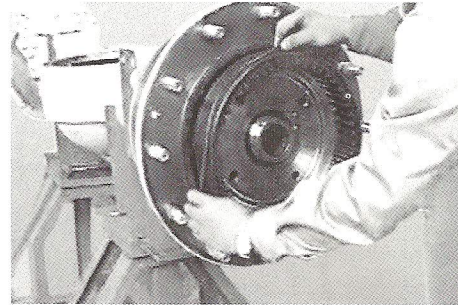
4. Dismounting and Assembling



- (3) Insert the screw into the open slot of taper cap, take down the taper cap from the lock nut of ring supporter.



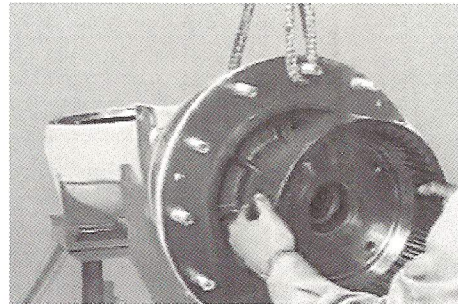
- (4) Take down the O-ring on the hub.



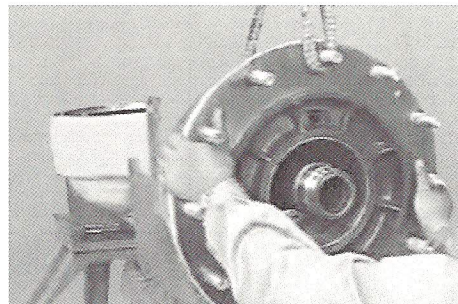
- (5) Take down the ring unit.

Note:

When take down the ring unit, please hang the hub by safety rope to keep it in level.



- (6) Lift the hub away by safety belt.



1.3 Take down the main reducer

- (1) Take down the assembling bolts of main reducer.



4. Dismounting and Assembling



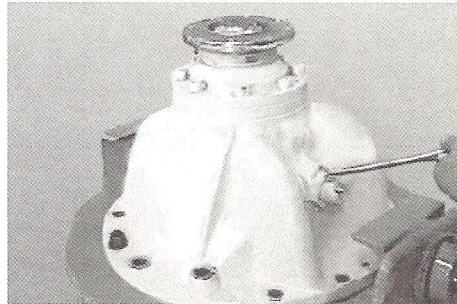
- (2) Take down the main reducer by suitable rope or clamp.



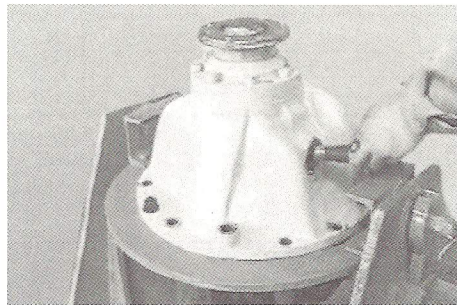
1.4 Dismounting of the main reducer

1.4.1 Dismounting of the differential

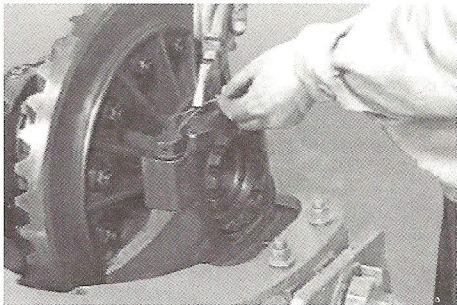
- (1) Open the safety of lock plate on the back-stopping bolt by hammer and screw.



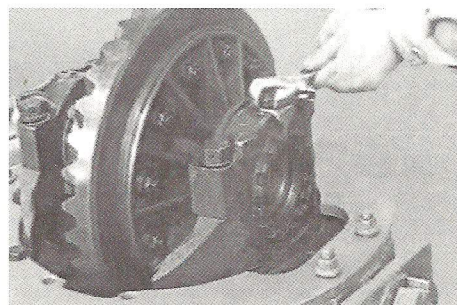
- (2) Unscrew the back-stopping bolt.



- (3) Take down the iron wire on the cover of main reducer by pliers

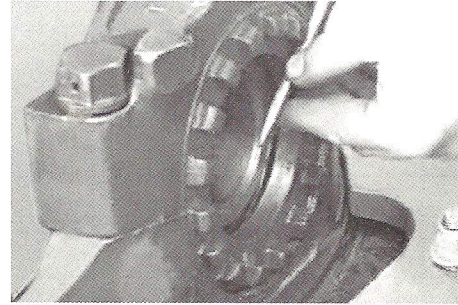
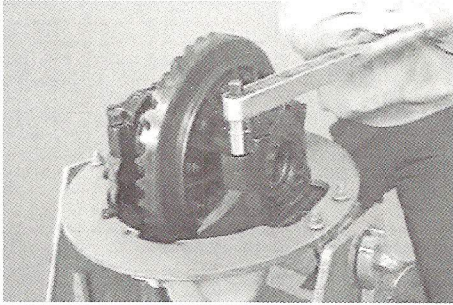


- (4) Take down the lock plate for cover.

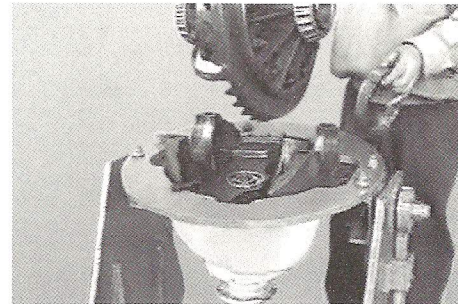
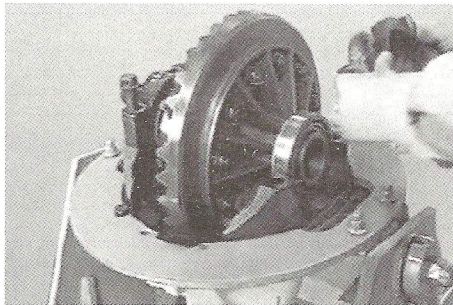


4. Dismounting and Assembling

- (5) Screw off the fastening bolts on the cover of main reducer.
- (6) Dismount the adjusting nut on the differential.

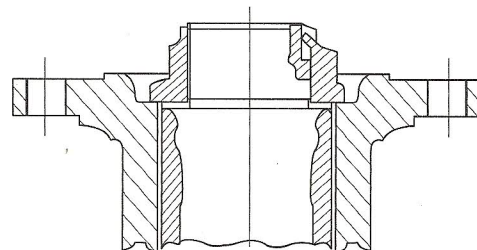
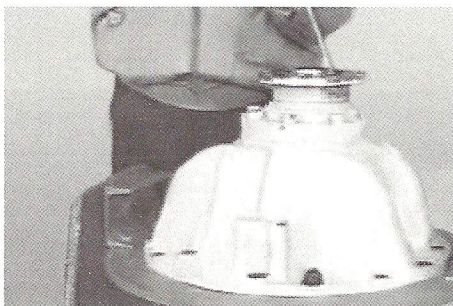


- (7) Make mark on the cover and the main reducer. Dismount the bolts for fastening the cover and take down the cover.
- (8) Lift out the differential from the shell by suitable rope.



1.4.2 Dismount the spiral bevel gear

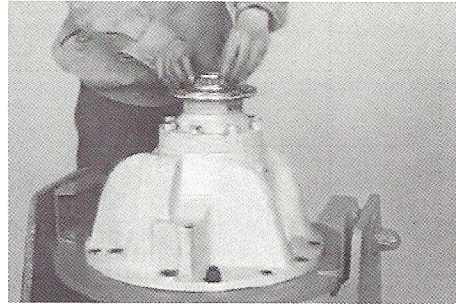
- (1) Open the safety on lock nut of drive spiral bevel gear by hammer and screw.



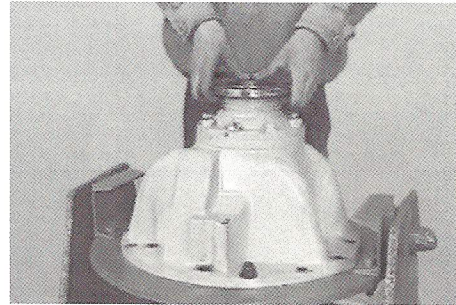
4. Dismounting and Assembling



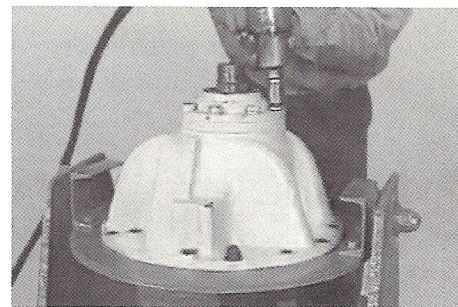
(2) Take down the lock nut.



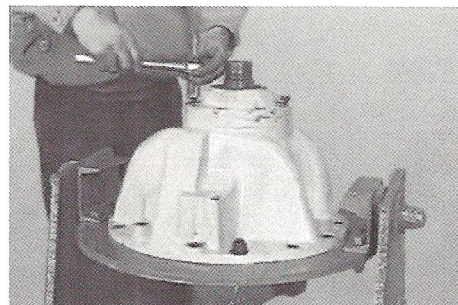
(3) Take down the input flange.



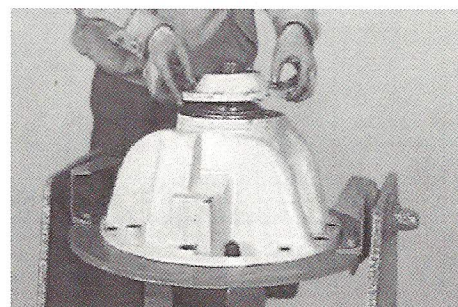
(4) Take down the bolts for fastening the oil seal cover.



(5) Screw the jacking screw to push out the oil seal cover.



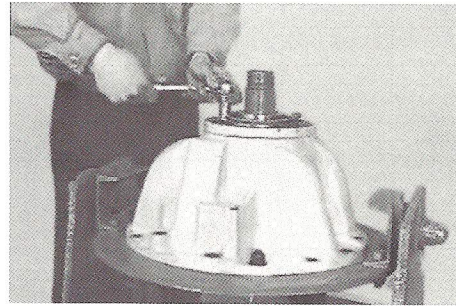
(6) Take down the oil seal cover.



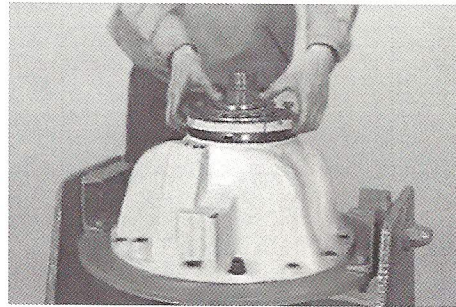
4. Dismounting and Assembling



- (7) Screw into the dismounting jacking screw of bearing base to push out the bearing base.

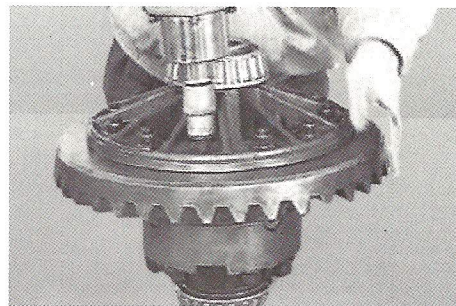


- (8) Take out the bearing base and main drive spiral bevel gear.

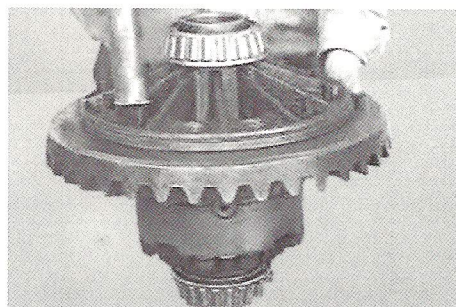


1.4.3 Dismounting of driven spiral bevel gear

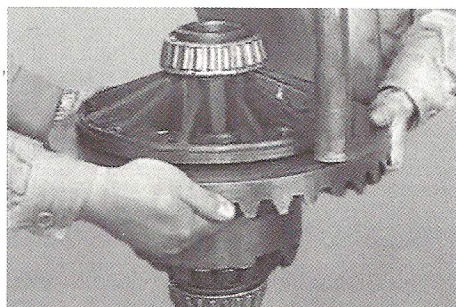
- (1) Take down the lock nut of driven spiral bevel gear.



- (2) Take down the fastening bolt of driven spiral bevel gear by copper stick.



- (3) Take down the driven spiral bevel gear by copper stick.



4. Dismounting and Assembling

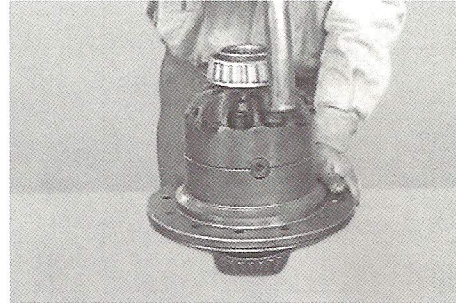


1.4.4 Dismounting of differential unit

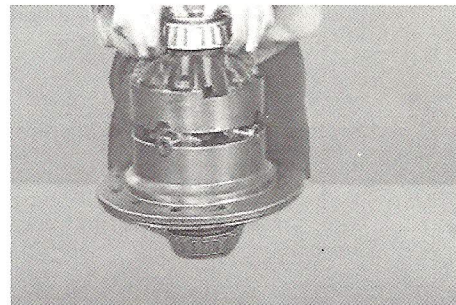
- (1) Take down the lock nut of differential shell.



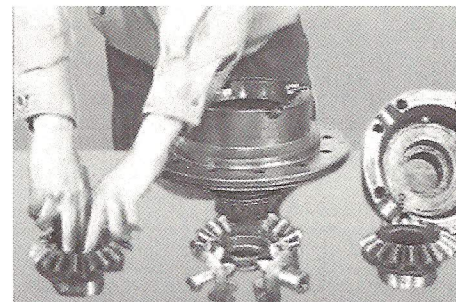
- (2) Take down the fastening nut of differential shell by copper stick.



- (3) Take down the small shell of differential.



- (4) Take out the half shaft gear, cross shaft and planetary gear.



2. Reinstalling and final assembly

- (1) Prepare the part before assembly

Note:

- 1) Obey with the manufacturer manual when clean the parts with strong solvent and alkalescence solvent.
- 2) The soap and water can be used to clean the non-mental part.

4. Dismounting and Assembling



Warning:

- 1) Take glassed and protection clothes when clean the parts.
- 2) Do the job at a proper place with good ventilating condition.
- 3) The gasoline and the solvent containing gasoline should not be used, the gasoline can incur exploding.

(2) The cleaning and drying to parts

Remove the remaining glue away from the parts before assembling and clean the parts completely. Avoid of the parts collide each other. The cleaned parts should have no iron scraps, rust spot, rust trace and burr. The tetrachloride, emulsification oil and cleanser epurated form petroleum can be used to clean the parts.

Clearly paper, clearly cloth and compressed air can be used to dry the parts.

Daub some grease on the parts which should be assembled at once to prevent them from rusting. Take anti-corrosion treatment for those parts that should be stored.

(3) Checking and repairing for the parts

Check all the parts before assemble them. The checking method as follows.

- 1) As for the bearing, check that the inner ring, outside ring and roller has scratch, weariness, crack or deformation or not. If the damaged has been found, the bearing should not be used again.
- 2) As for the gear, check that if the tooth has over weariness, crack, peeling and abnormal distortion or not. The damaged part should not be used again.
- 3) As for the shell, check that if the effected surface has crack, dent and over weariness or not.
- 4) As for the joint, check that if the screw has distorted tooth, collision and abnormal distortion or not.
- 5) As for the lock shim and oil seal, they can't be used again after dismounted.
- 6) As for the burr or collision mark on the unimportant surface, repair it then use it.

(4) Take care in the progress of assembly

- 1) Take protection measures, for example gloves, protection shoe and protection glasses, when assembling.
- 2) The screwing torque to bolt must comply with relative standards.
- 3) Daub the 262 glue onto the screw of fasten and Letai 598 glue on the plane connection when assembling.
- 4) When assemble the bearing, install all the parts in place by sleeve and copper hammer.
- 5) Assemble the rolling needle in planetary gear according to group, the needle from different batch should not be assembled into a planetary gear.

Warning:

- 1) Tooling and rubber hammer is necessary when install the oil seal, otherwise the oil seal should leak oil for the sake of improperly assembly.
- 2) Screw all fastener with enough torque, otherwise the O-ring and other oil seal will leak oil, even whole wheel can move outward to incur incident.
- 3) The moving an lifting to part should be smooth and reliable. The sliding, tilting and falling of part can injury personal and damage machine.

4. Dismounting and Assembling



2.1 Assembly of hub

- (1) Daub 262 glue onto the bolt and install the brake disc, then fasten the bolt (The screw torque 380~450Nm.).



- (2) Press it into the outside ring of hub bearing, then install the inner ring of bearing. Take care that assemble the part in place.



- (3) Press and install the oil ring in place.



- (4) Daub some grease onto the hub hole and daub a little grease on the outside ring of oil seal and daub some grease on the mouth of oil seal. Make the slot of oil seal face to the bearing, press and fix the single lip oil seal and double lip oil seal. Keep level and assemble firmly

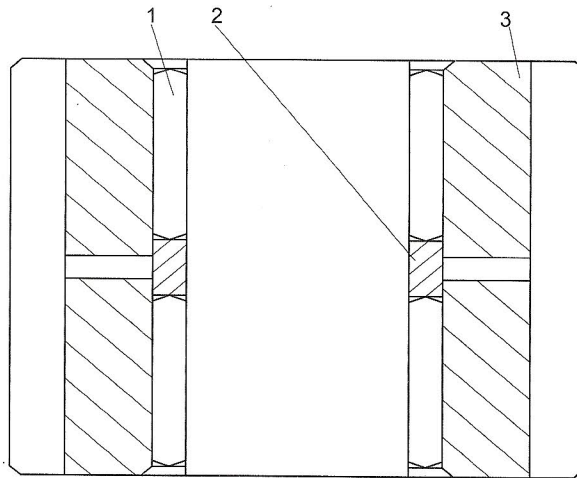


2.2 Assembly of planetary wheel bracket

- (1) Assembling the planetary wheel

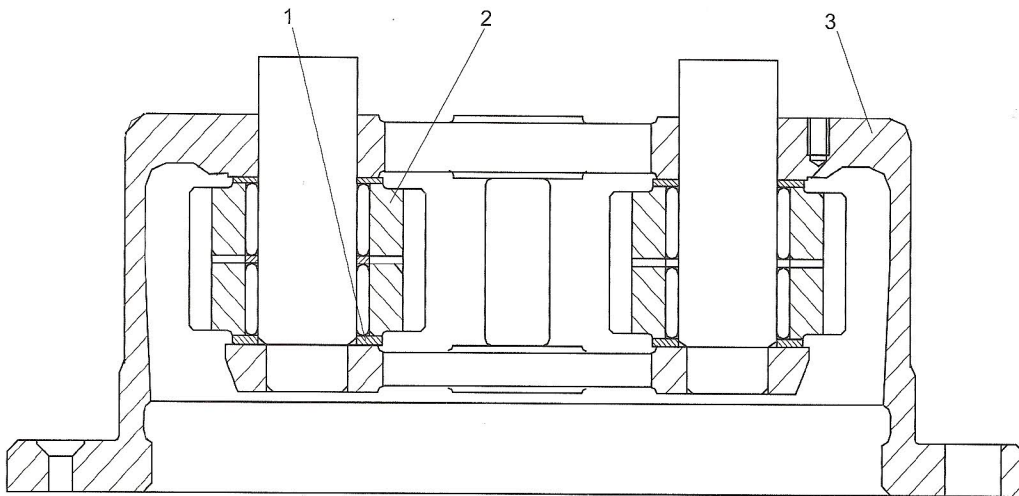
Daub a layer of lithum base grease into the inner hole of planetary wheel 3. dispose the rolling needle 1 on one end of the inner hole evenly, then install the spacer 2. Assemble the rolling needle on another end of inner hole.

4. Dismounting and Assembling



(2) Assemble the planetary wheel 1 pad and planetary wheel unit

Place the planetary wheel bracket 3 levelly, put the planetary wheel pad 1 on the lower side of the hole of planetary wheel bracket, then put the planetary wheel unit 2 on a pad, put another pad on the planetary wheel unit and make hole of wheel bracket and planetary gear in a direct line.



(3) Press the planetary wheel shaft into the hole of wheel bracket and planetary gear. After assembling, the planetary wheel can be turned freely .

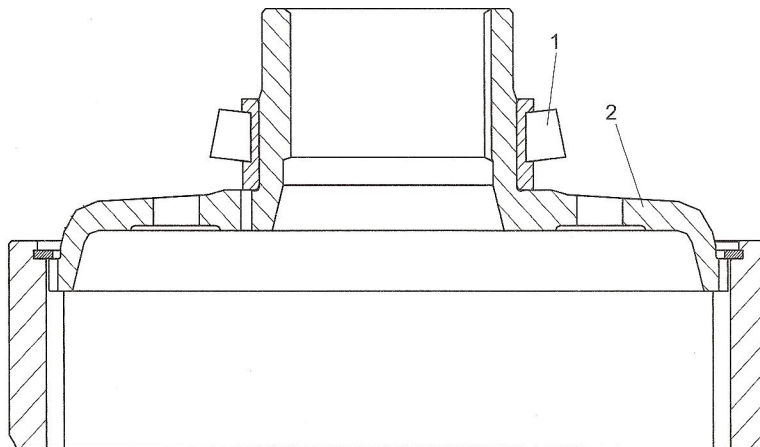


4. Dismounting and Assembling



2.3 Assembly of gear ring supporter and bearing

Heat the bearing until its temperature reach to 90~100°C and keep the temperature for 30 minutes. Install the bearing onto the gear ring supporter while the bearing is hot, ensure the installation is in place.

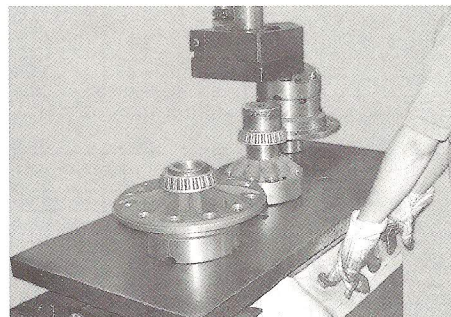


2.4 Assembly of main reducer

2.4.1 Assembly of differential

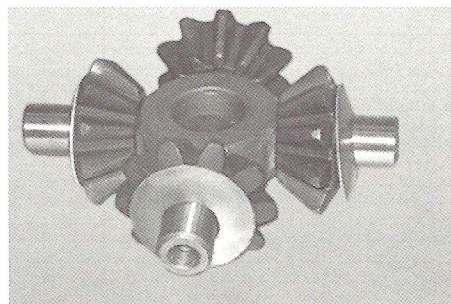
(1) Press and install the differential bearing

- 1) The big and small shell of differential should be used in pair.
Daub a thin layer of grease on the fixing place of differential shell.
- 2) Press and install the inner ring of bearing into the shaft neck of big and small shell of differential, ensure install it in place.



(2) Assembly of cross shaft

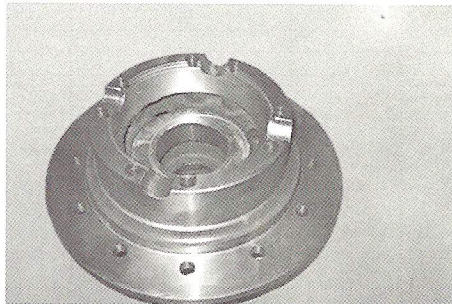
Install a planetary gear and a pad on every arm of the cross shaft.



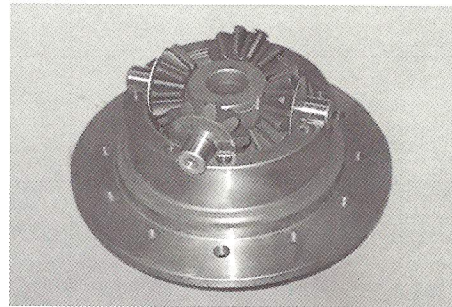
4. Dismounting and Assembling

(3) Assembly of half shaft gear, half gear pad and cross shaft unit.

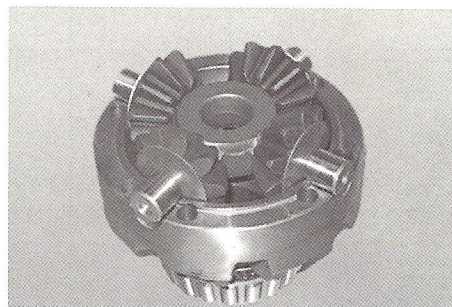
1) Install the half shaft gear pad into the big shell of differential and make the side with oil slot face to air, daub some oil.



2) Put into the half shaft gear, put the assembled cross shaft into the cross hole of differential big shell by bearing it lightly with copper stick. Take the dial indicator to measure and select the half shaft gear pad, ensure the engagement clearance is 0.18~0.23mm.

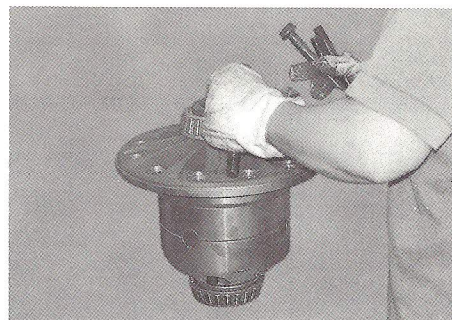


3) Assemble and inspect the small shell of differential with the same method.



(4) Install the flange bolt and lock nut.

1) Daub oil on the planetary gear and align the big and small shell. Cross through the big shell of differential or beat the bolt lightly with hammer to make assembly in place.



2) Daub glue on the screw evenly, then screw into the nut and fasten it. The fastening torque is 206~245Nm.



4. Dismounting and Assembling



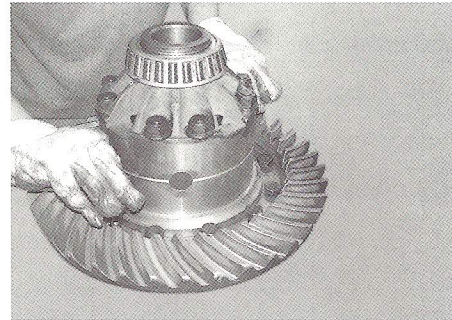
- 3) Screw into the nut. The fastening torque is 206~245Nm.



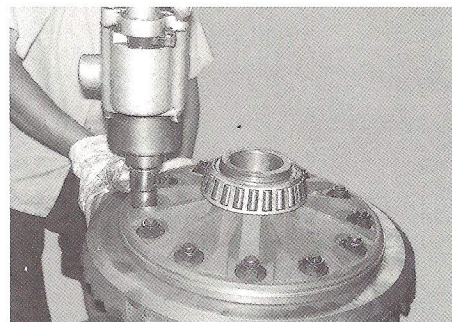
- 4) Check the rotation of half shaft gear and planetary gear. The half shaft gear and planetary gear can be turned freely.

(5) Install the big spiral bevel, lock bolt an nut.

- 1) Align the big spiral taper gear to the bolt hole of differential big shell, ensure the assembly is firm.



- 2) Daub glue onto the screw, screw the nut 19 and fasten it. The fastening torque is 150~180Nm.

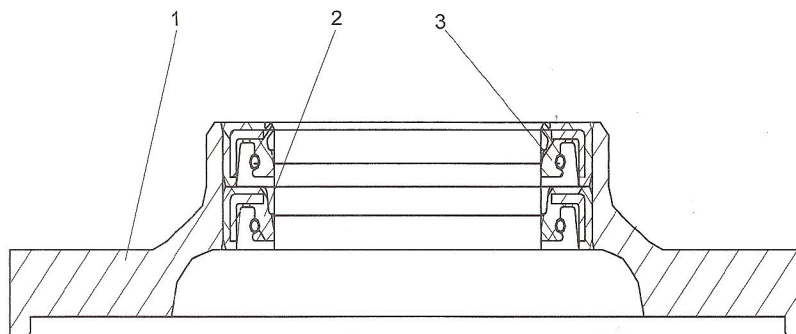


2.4.2 Assembly if gear ring supporter and bearing

Daub a thin layer of grease on the outer ring of oil seal 2 and 3. install the oil seal 2 and 3 into the hole of oil seal cover, make the slot downwards.

Note:

Daub 3# lithium base grease onto the lip of oil seal, fill enough grease between two oil seals.

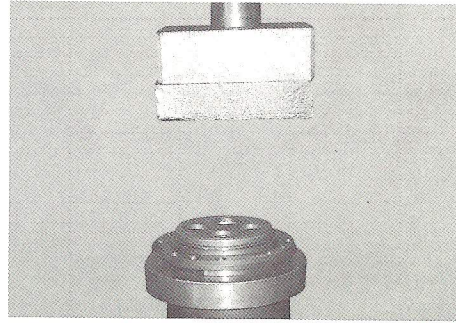


4. Dismounting and Assembling

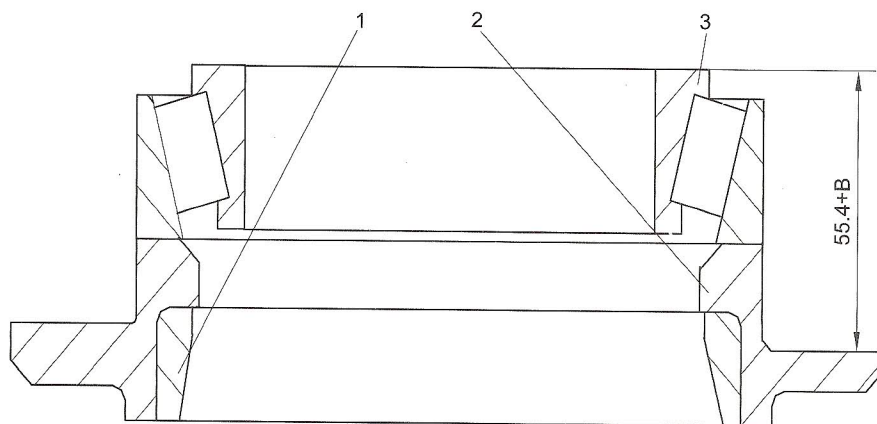


2.4.3 Assembly of bearing base and the selection of adjusting spacer

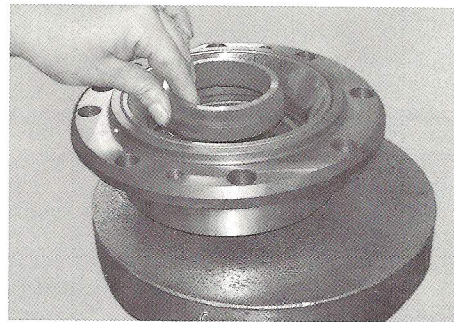
- (1) Press the bearing into the bearing base.



- (2) Overturn the bearing base and put it on a platform, put the bearing 3 on the bearing base. Record the value B.



- (3) 0.02~0.05mm. Choose the proper adjusting spacer with suitable thickness. Make the bearing clearance is 0.02~0.05mm.



2.4.4 Press the drive spiral bevel gear unit

- (1) Press and install the bearing base to the drive spiral bevel gear.



4. Dismounting and Assembling



- (2) Daub seal glue evenly on the plane between bearing base and shell of main reducer.



- (3) Press and install the inner ring to the drive, don't install it in place.



- (4) Install a ring on the bearing outer ring near the small end of small bevel, press an install it into the main reducer, daub seal glue onto the end section of main reducer shell.

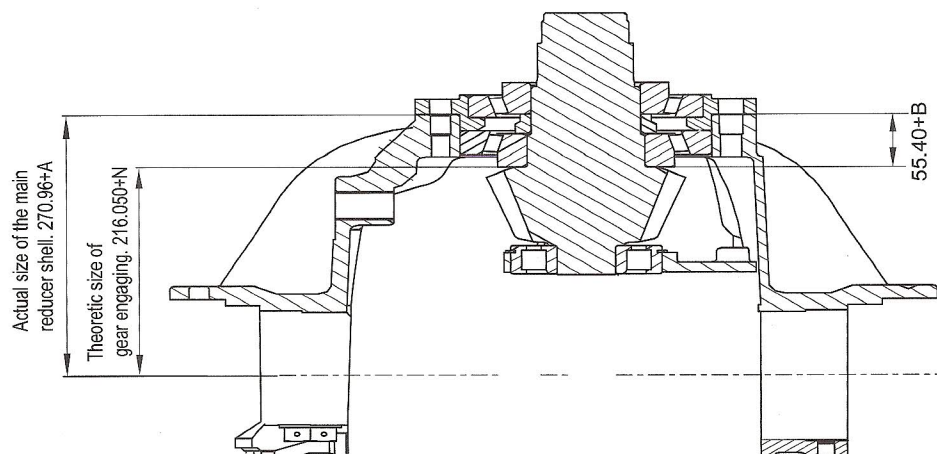


- (5) Calculate the thickness of lower adjusting shim of bearing base: $\delta = 0.49 - A + B + N$

A--The deviation to the theoretic value of main reducer shell.

B--The deviation to the bearing base.

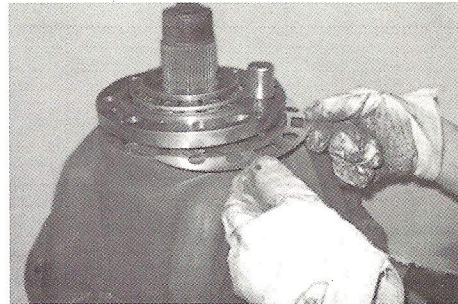
N--Deviation to the engaging center marked on the small spiral bevel.



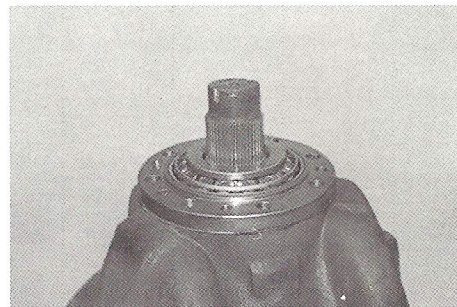
4. Dismounting and Assembling



- (6) Put the small spiral bevel into the main reducer shell, choose a adjusting pad with suitable thickness and put it between main reducer shell and bearing base

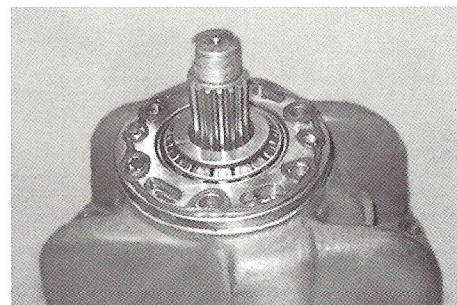


- (7) Press and install the drive spiral taper gear in place.



2.4.5 Assembly of cover unit (Oil seal and oil seal base)

- (1) Daub seal glue evenly on the bearing base.



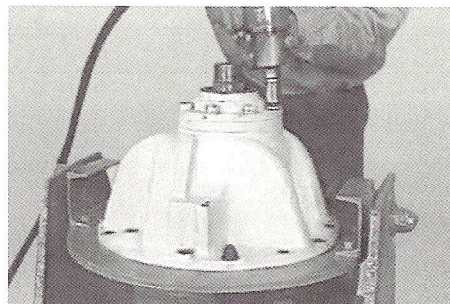
- (2) Place the cover unit and make the hole of cover aligning to the hole of bearing base. Screw the bolt M14 × 1.5 and M12 × 1.5.



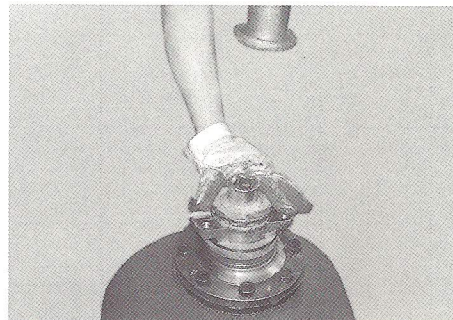
4. Dismounting and Assembling



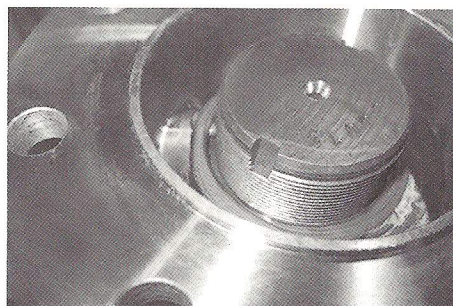
- (3) Screw every bolt tightly. The fastening torque to $M14 \times 1.5$ bolt is 120~130N.m. The fastening torque to $M12 \times 1.5$ bolt is 80~100N.m.



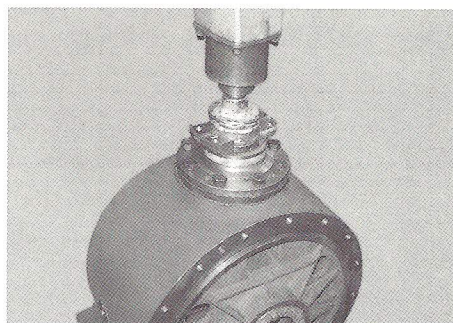
- (4) Engage the spline which connecting the flange spline and spiral taper gear, beat it with tooling and copper stick to make it in place.



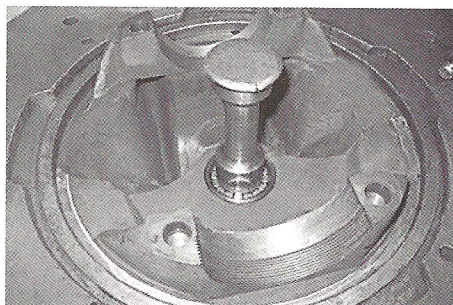
- (5) Daub seal glue evenly on the end side of flange corresponding to lock nut.



- (6) Screw lock nut to the small spiral taper gear, the fastening torque is 800~850Nm. If the 75500269 lock slot nut has been adopted, the 75500231 washer should be used. The flange should rotate freely when be turned by hand.



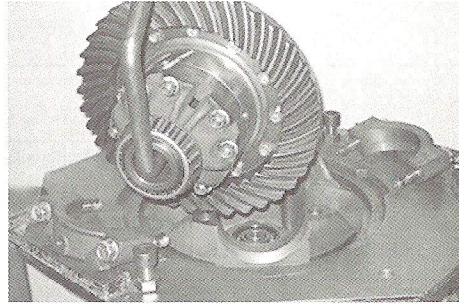
- (7) Assemble the inner ring of bearing in place with tooling sleeve and hammer.



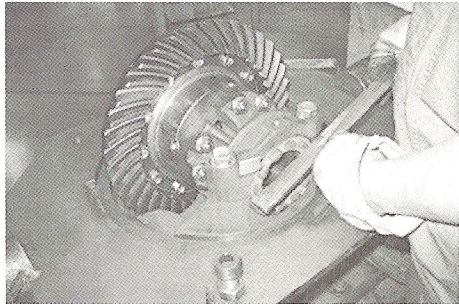
4. Dismounting and Assembling

2.4.6 Assembly of differential and adjustment of gear clearance

(1) Lift and install the differential into the main reducer shell.

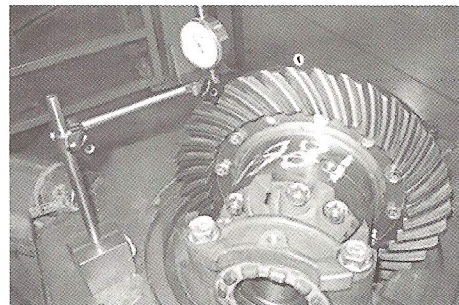


(2) Lift the differential and install the outer ring of bearing, adjust the gear clearance and touching area of main drive taper gear couple by adjusting the differential nut.



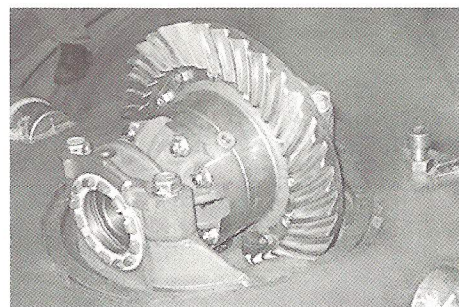
(3) Check the gear clearance:

Turn the big spiral taper gear and inspect the clearance with dial indicator, the gear clearance must be 0.3~0.4mm. the clearance between two bearing on differential must be 0. If the clearance exists, please adjust it repeatedly, and at the same time, check the engaging clearance.

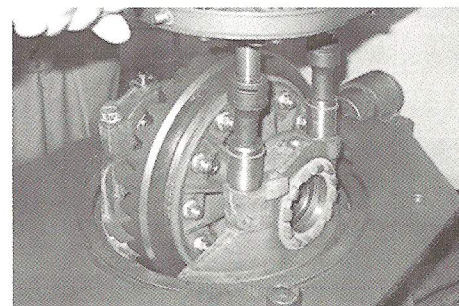


(4) Check the contacting area:

Use a brush to paint red lead powder on three teeth faces evenly divided on the helical cone gear. Turn the helical cone gear to make contact prints. Make some adjustment to have a print equal or more than 1/2 of the total tooth length, from the upper end of the teeth to middle of the teeth. If the contact print is irregular, choose the suitable adjustment shim and adjust the position of differential nut 1.



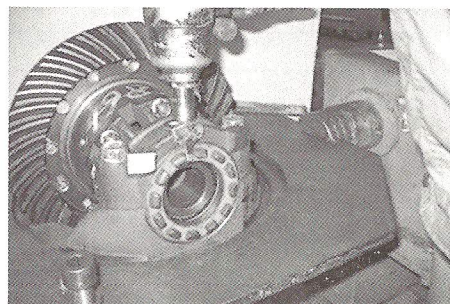
(5) Screw the bolt 24, the fastening torque is 410~450Nm.



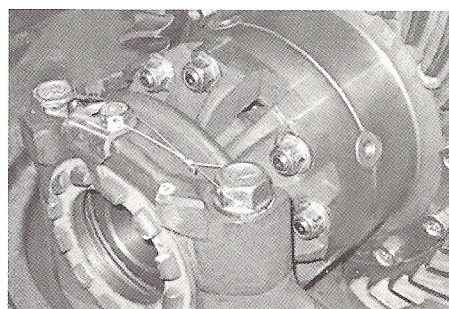
4. Dismounting and Assembling



- (6) Fix the lock shim on the tile by bolt, the fastening torque is 40~50Nm. Knock the claw of lock shim into the groove of differential nut by hammer.

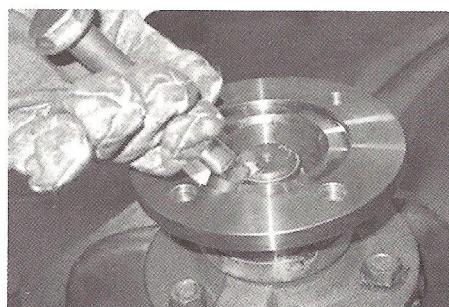


- (7) Cross the iron wire through bolt 24 and 25, and bind the iron wire into 8 shape to prevent loosening.



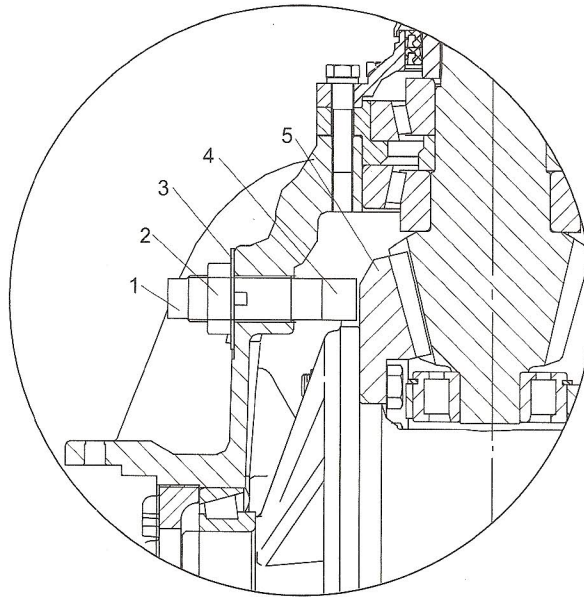
2.4.7 Riveting of lock nut

Rivet the lock nut into the tail end of small spiral bevel to prevent loosening.



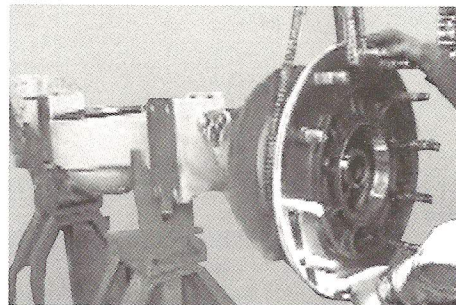
2.4.8 Assembly of stop-push bolt

- (1) Daub little grease into the inner hole of copper sleeve 4 and install it onto the head end of stop-push bolt 1.
- (2) Install the lock shim 3 and nut 2 on the stop-push bolt 1.
- (3) Daub seal glue evenly into the screw of main reducer shell, then screw the stop-push bolt into the screw hole. Don't make the copper sleeve fall off.
- (4) Screw the stop-push bolt 1 until the head of bolt push the back of big spiral bevel.
- (5) Screw back the stop-push bolt for 1/4 round, screw up the nut 2, so the joint flange can be turned freely by hand.
- (6) Bend one lock tongue of lock shim onto the main reducer, bend the another onto the nut 2.

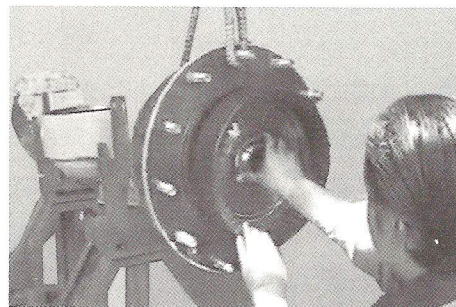


2.5 Assembly of hub

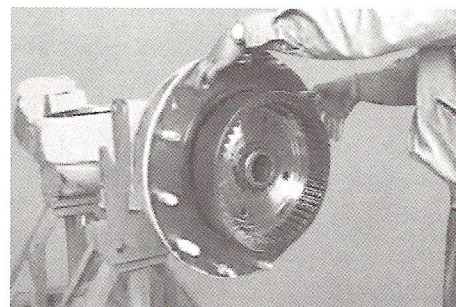
- (1) Lift the hub levelly and install it in place. Ensure the lift tool reliable and the lift smooth, avoid of damage the oil seal.



- (2) Assemble the ring supporter and taper sleeve, screw the nut and rotate it 2~3 round.



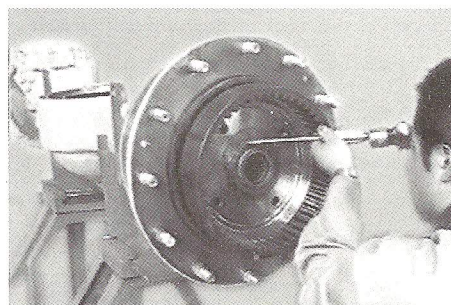
- (3) Screw the first lock nut with the torque of 350~400N.m, at the same time turn the hub to make the bearing at right position. Then screw off the nut until the hub can rotate freely even if be stressed with a horizontal force of 70N.



4. Dismounting and Assembling



- (4) Install the lock shim, clip the first lock nut with claw. Screw the second lock nut, the fastening torque is 350~400N.m. overturn the claw of lock shim to the groove of second lock nut, the hub can be turned 2 round freely.



2.6 Assembly if main reducer

- (1) Daub seal glue on the section of axle shell, the diameter of glue column must be 1.6~2.2mm. The glue daubing must be continuous.



- (2) Lift and install the main reducer and put it onto the axle shell. The lift must be smooth.

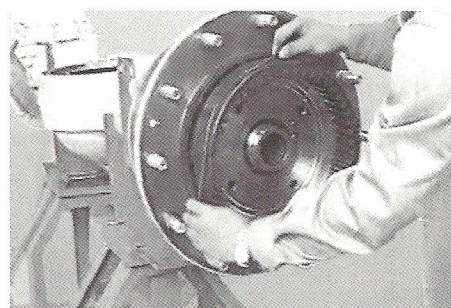


- (3) Sleeve the bolt with washer, daub glue on the surface of screw and screw it into the hole. Screw up the bolt and fasten it with spanner, the fastening torque is 160~186N.m. when you rotate the input flange of main reducer, the flange should rotate freely.



2.7 Planetary wheel carrier mounting

- (1) Fix O ring on wheel hub.



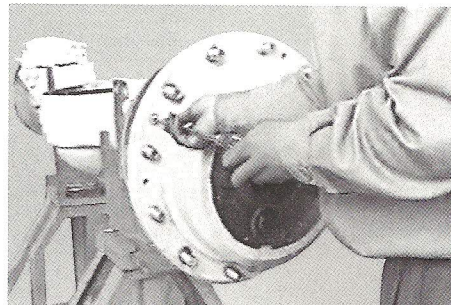
4. Dismounting and Assembling



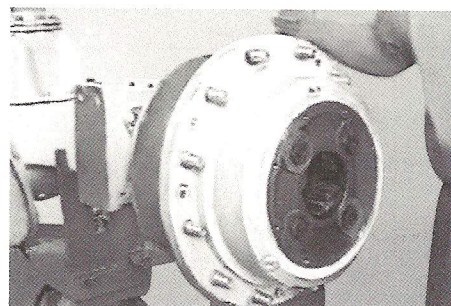
- (2) Have the planetary wheel carrier assembly hoisted. After lining up the three screw holes on both the planetary wheel carrier assembly and the wheel hub, assemble them together by pushing with full contact. Remember to maintain stability during hoisting, avoiding falling down.



- (3) Tighten the three screws and make sure the screw heads are sunken below the planetary wheel carrier's surface.

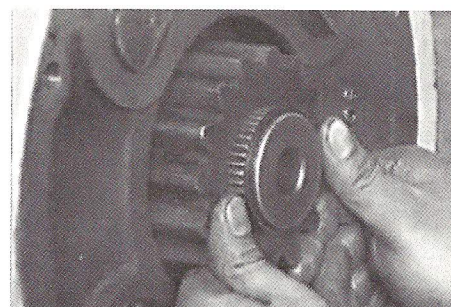


- (4) Turn the planetary wheel carrier two or more full turns with hands. The planetary wheel shall engage with the gear ring properly and no seizure allowed.

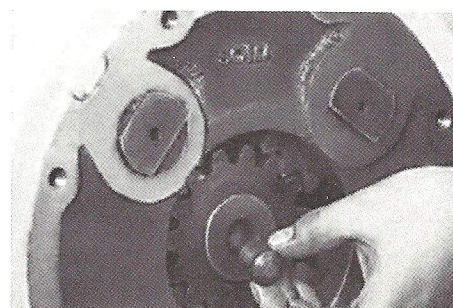


2.8 Assembly of half shaft, planetary gear and wheel end cover

- (1) Insert the half shaft, then put the sun gear on it. After assembling the retainer ring, push them in place. Preassemble the adjusting strut. Great care shall be taken to prevent crushing of hands during operation.



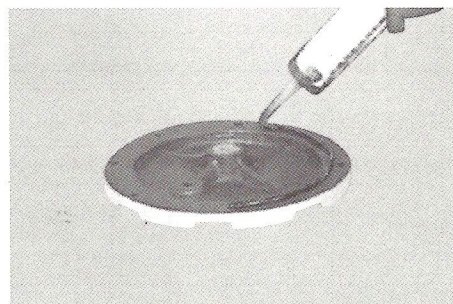
- (2) Choose appropriate adjustable strut and make sure it is 1 to 2mm away from the upper limit block of the end cover. Apply few grease on the adjustable strut and fix it into the hole on the half shaft end.



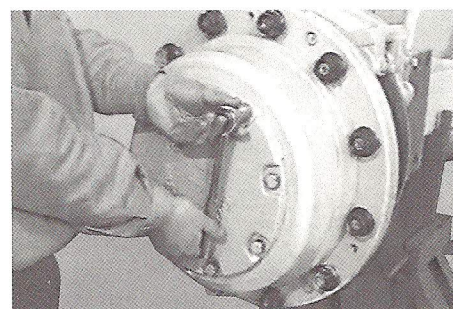
4. Dismounting and Assembling



- (3) Apply sealant to the end cover evenly and continuously.



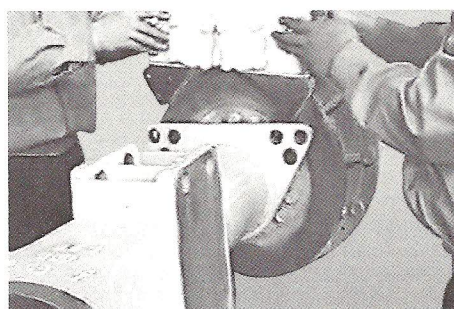
- (4) Secure the end cover on the planetary wheel carrier using washer for bolt by cross and symmetric turning. Tightening torque for M12 is 63~84N.m and 40~47N.m for M10.



- (5) Turn the wheel hub 2 or more full turns by hand. The wheel hub shall be turned freely and easily without seizure.

2.9 Mout the braking caliper

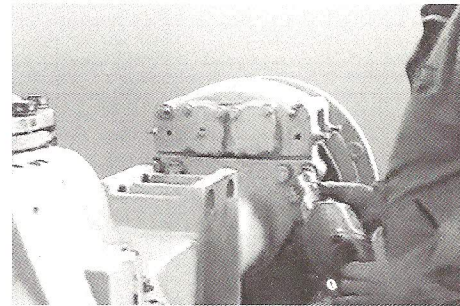
- (1) Have the right and left braking caliper hoisted. After putting in the friction plate, assemble the braking caliper on the braking disc. Make sure the inlet hole on the braking caliper is in line with the breather on the axle housing. The lifting device and slings shall be reliable. Maintain stability during hoisting operation.



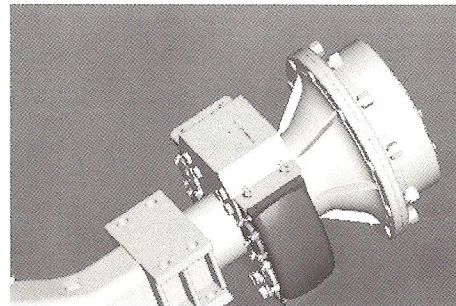
4. Dismounting and Assembling



- (2) Put washers on bolts. After applying tightening glue on the threaded surface, screw it into the screw hole. Bolts with full thread shall be screwed into outer holes. Tighten the bolts symmetrically with a tightening torque of 380~500N.m.

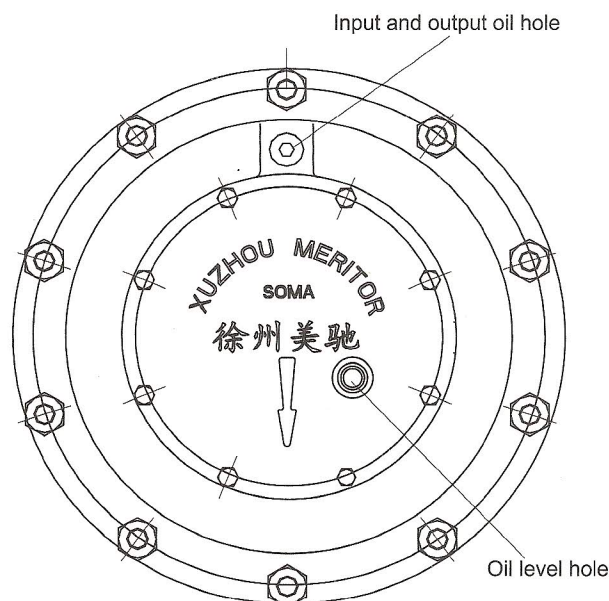


- (3) Put dust proof cover over braking caliper and line up the screw holes. After applying tightening glue on threads of bolt, put spring washer and flat washer on it, then screw it into the hole. Tighten with a tightening torque of 33~43N.m. (Such operation is only required by C216NZS-1 axle).



2.10 Commissioning

- (1) Remove the plugs from main reducer and final reducer and fill in GL-4 85W/90 gear oil. Filling capacity shall be controlled by referring to the oil orifice on the axle. The upper limit of oil level shall be the lower line of the oil orifice and few overflowing is allowed. The lower limit is at the place 8mm below the lower line of the oil orifice. For final reduction filling, you should turn the wheel first to have arrowhead pointing downward vertically.



4. Dismounting and Assembling



- (2) Screw in the plugs. Check seal 24 for wear and cracks before screwing in the plugs. Replace in time, if necessary. All compound seals numbered 12 must be replaced. Tightening torque for plugs are as follows:

Z1/8" 11.7-14.7N.m

ZG3/4" 63.7-73.5N.m

M24*1.5 34.3-44N.m

M12*1.25 7.8-9.8N.m

- (3) Start up the machine (run forward and reverse for 5 seconds respectively) and observe the drive axle, which should run smoothly without seizure. There should be no obvious noise within the main and final reducers. If there're irregularities, analyze and resolve the problems.

- (4) Check all parts for leakage. If there's any, analyze and resolve.

- (5) Start up the machine (run forward and reverse for 5 seconds respectively). The axle shall run smoothly without irregularities, noise and overheated parts.

- (6) During commissioning, use a tommy bar to obstruct friction plates with braking caliper to test braking and differential on both sides. Braking shall be accurate and reliable. No seizure occurs with differential.

Dismounting of the steering cylinder unit

 Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

 Release the remnant pressure inside of the pipelines.

Lift up the front part of the bucket for 30~50mm and down the rear part to the ground by operating the knob, and then stop the engine.

Then check whether the whole underside of the bucket touch the ground or not.

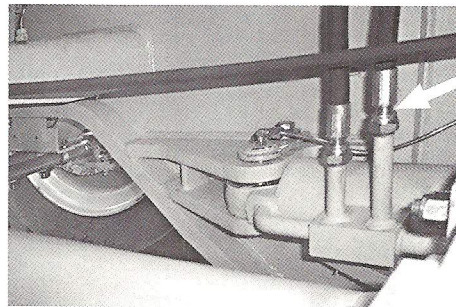
Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

 Cut off the power from the negative pole of the battery cell.

1. Hydraulic hoses

Dismount the hoses at the end of the steering cylinder.

 Insert a plug into the hose after dismounting in case any dirt or dust may come inside.



2. Steering cylinder

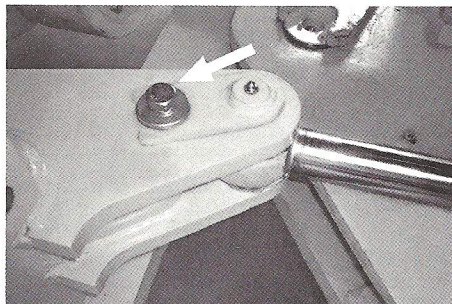
(1) Dismount the lubricant pipeline of the front pin;

(2) Loose the bolt, take down the front and rear pins upwards.

(3) Take down the steering cylinder.

 This operation should be done by two persons at the same time.

 Steering cylinder: 25 kg.



Assembling of the steering cylinder unit

Adopt the opposite sequences of the dismounting for assembling

 Use a rod to align the pin holes when necessary, do not use your finger.

 Get rid of the oil and grease on the cylinder rod completely, and wipe off all the squeezed grease.

Dismounting of the tilt cylinder unit

 Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

 Release the remnant pressure inside of the pipelines.

Lift up the front part of the bucket for 30 ~ 50mm and down the rear part to the ground by operating the knob, and then stop the engine.

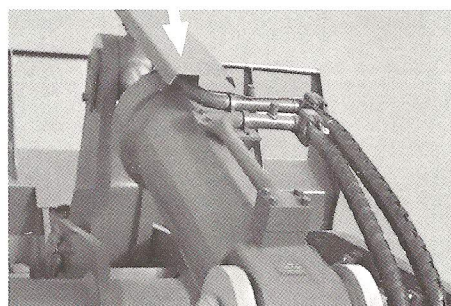
Then check whether the whole underside of the bucket touch the ground or not.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

 Cut off the power from the negative pole of the battery cell.

1. Dismount the automatic leveling sensor

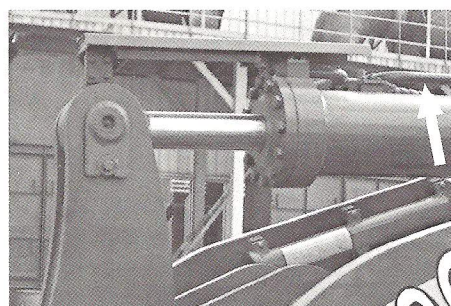
- (1) Cut off the circuit;
- (2) Loose the connecting bolts and take down the automatic leveling sensor.



2. Hydraulic hoses

Disconnect the hydraulic hoses linking with the tilt cylinder.

-  Insert a plug into the hose after dismounting in case any dirt or foreign mater may come inside.



4. Dismounting and Assembling

3. Tilt cylinder

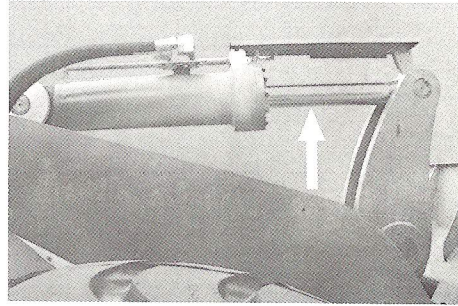
(1) Lift up the oil cylinder, take down the locking bolt and then the position pin;

- △ Be careful of the barycenter and tie these two points firmly when lifting.
- △ Check the quantity and thickness of the pads, and keep them in a safe place.

(2) Lift the cylinder away.

- △ Do not damage the piston rod.

 Tilt cylinder: 250kg.



Assembling of the tilt cylinder unit

Adopt the opposite sequences of the dismounting for assembling

- ⚠ Use a rod to align the pin holes instead of your finger.
- △ Do not twist the hose when assembling. Do not enwind these hoses

Dismount the lift cylinder unit

- ⚠ Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

- ⚠ Release the remnant pressure inside of the pipelines.

Lift up the front part of the bucket for 30~50mm and down the rear part to the ground by operating the knob, and then stop the engine.

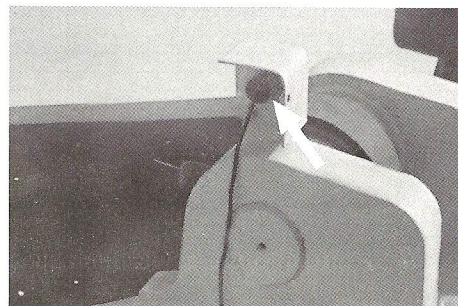
Then check whether the whole underside of the bucket touch the ground or not.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

- ⚠ Cut off the power from the negative pole of the battery cell.

1. Lift limit mechanism of the boom (Optional)

- (1) Cut off the circuit;
- (2) Loose the bolt of the assembly bracket for fixing the lift limit mechanism of the boom, and then take down the limit mechanism.



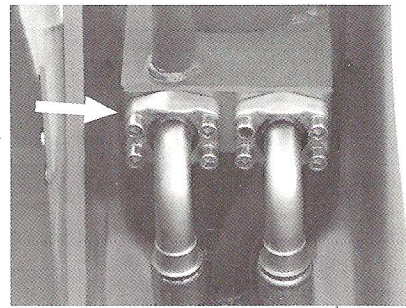
4. Dismounting and Assembling



2. Hydraulic hoses

Disconnect the hydraulic hoses linking with the lift cylinder.

- △ Insert a plug into the hose after dismounting in case any dust or foreign mater may come inside.



3. Lift cylinder

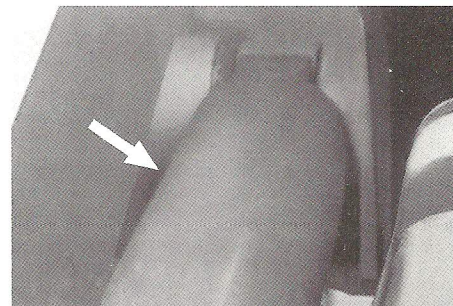
- (1) Lift up the cylinder, take down the locking bolt and then the position pin;

- △ Be careful of the barycenter and tie with the two points firmly when lifting.
- △ Check the quantity and thickness of the pads and keep them in a safe place.

- (2) Lift away the cylinder.

- △ Do not damage the piston rod.

 Lift cylinder: 178kg.



Assembling of the lift cylinder unit

- ⚠ Use a rod to align the pin holes when necessary instead of your finger.
- △ Insert the O-ring into the slot firmly.
- △ Do not twist the hoses when assembling. Do not enwind these hoses with each other.

Dismounting of the working device unit

- ⚠ Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

- ⚠ Release the remnant pressure inside of the pipelines.

Lift up the front part of the bucket for 30 ~ 50mm and down the rear part to the ground by operating the knob, and then stop the engine.

Then check whether the whole underside of the bucket touch the ground or not.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

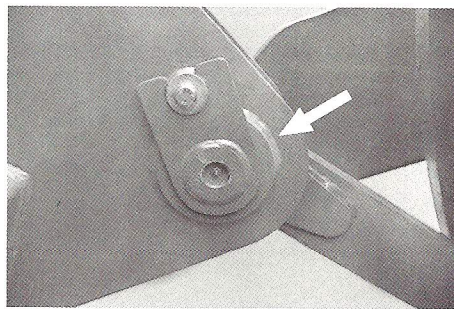
- ⚠ Cut off the power from the negative pole of the battery cell.

4. Dismounting and Assembling

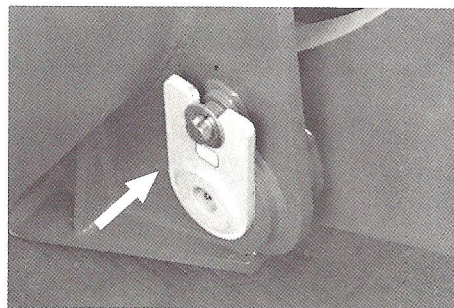


1. Bucket pulling rod

- (1) Loose the fixing bolt of the assembly pin on the bucket pulling rod and take down the pin;



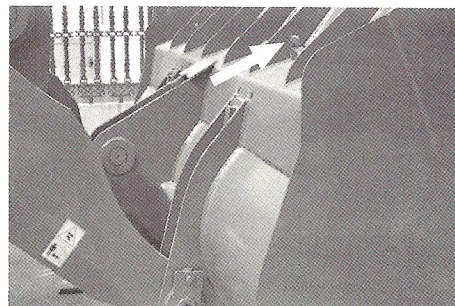
- (2) Loose the bolt for fixing the bucket and the boom assembly pin and take down the pin;



- (3) Move the loader backwards and lift away the bucket with lifting hooks.



Bucket (with teeth): 1300kg.



2. Take down the tilt cylinder unit

Please refer to the section of "Dismounting of the tilt cylinder" for details.

3. Take down the lift cylinder unit

Please refer to the section of "Dismounting of the lift cylinder" for details.

4. Boom, rocker and pulling rod

Lift up the boom, rocker and pulling rod unit, loose the bolts for fixing the boom assembly pin, pull out the assembly pin and then lift away the unit.



Boom: 1190kg.

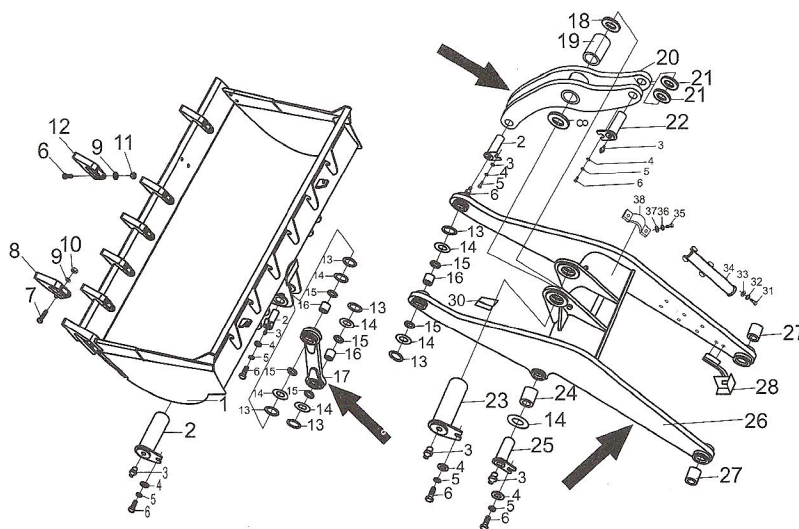
Rocker: 346kg.

4. Dismounting and Assembling



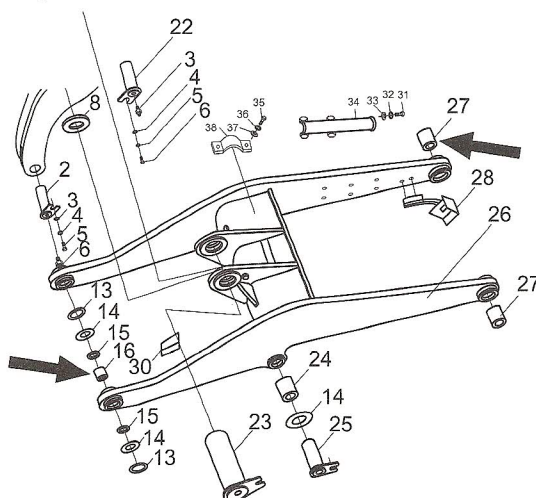
Pulling rod: 52kg.

△ Check the quantity and thickness of the pads if necessary and keep them in a safe place.

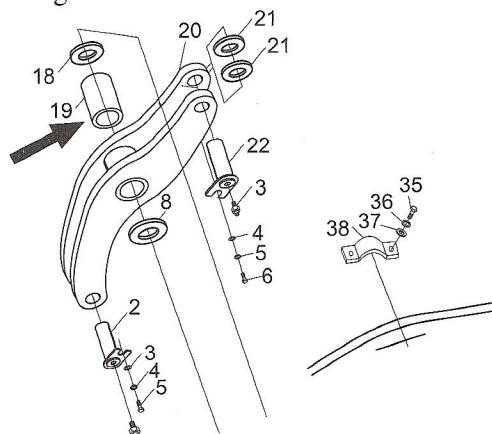


5. Shaft sleeve, O-ring and oil-seal

(1) Pull out the shaft sleeve, O-ring and oil-seal from the boom.



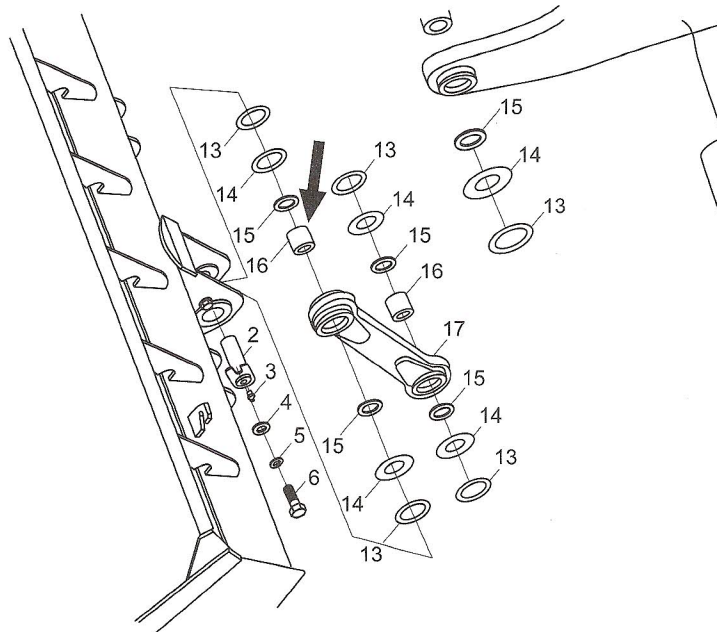
(2) Pull out the shaft sleeve, O-ring and oil-seal from the rocker.



4. Dismounting and Assembling



3) Pull out the shaft sleeve, O-ring and oil-seal from the end of the pulling rod.



Assembling of the working device unit

Adopt the opposite sequences of the dismounting for assembling.



Use a rod to align the pin holes instead of your finger if necessary.



Grease every assembly pin.

Dismounting of the counterweight



Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

Lift up the counterweight, take down the assembly bolts and then lift away the counterweight.



Keep its balance when lifting away the counterweight.



Counterweight: 1500kg.

Assembling of the counterweight

Adopt the opposite sequences of the dismounting for assembling.

Dismounting of the fuel tank unit



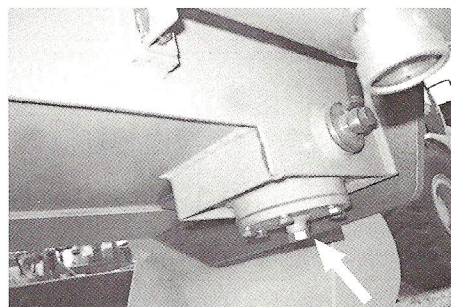
Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

4. Dismounting and Assembling



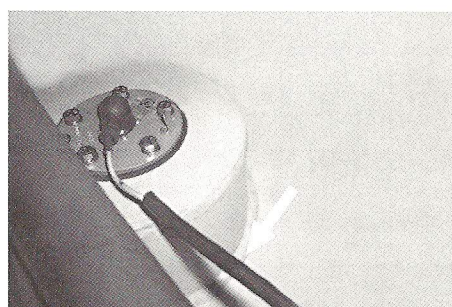
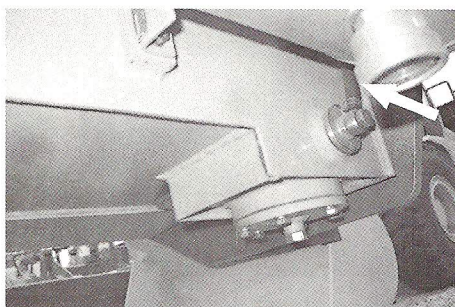
1. Drain away the oil

Loose the drainage plug to drain away the fuel.



2. Fuel hose and wire

- (1) Disconnect the fuel hose from the tank;
- (2) Disconnect the wire to the fuel level sensor.



Dismounting of the counterweight

- (1) Lift up the fuel tank, take down the assembly bolts and then put it down slowly;

△ Place a plane carriage under the fuel tank. Put the fuel tank on the plane carriage slowly and keep it in balance.

 Fuel tank: 205kg (empty).

- (2) Pull the fuel tank out from the rear framework of the loader.

Assembling of the fuel tank unit

Adopt the opposite sequences of dismounting for assembling.

Dismounting of the left trestle

⚠ Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

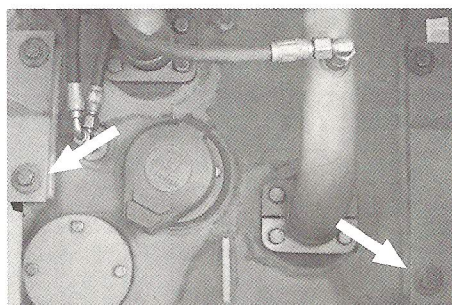
4. Dismounting and Assembling



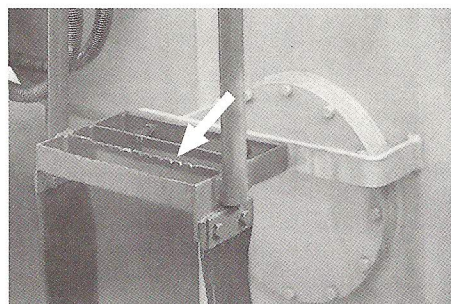
- (1) Lift up the left trestle;



- (2) Open the up cover of the left trestle, and loose the bolts for connecting with the hydraulic oil tank;



- (3) Loose the bolts for connecting the foot-plate with the hydraulic oil tank;



- (4) Lift the left trestle away from the machine.

 Kg Left trestle: 80kg.

Assembling of the left trestle

Adopt the opposite sequences of dismounting for assembling.

Dismounting of the right trestle

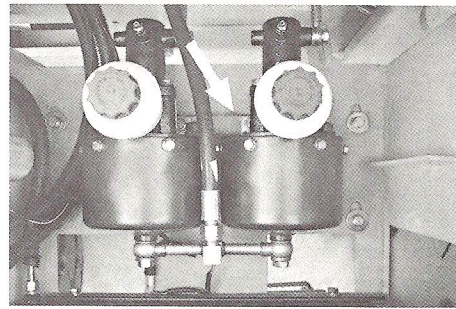
 Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

4. Dismounting and Assembling



1. Boost cylinder

Loose the fixing bolt for boost cylinder and hang it by rope.

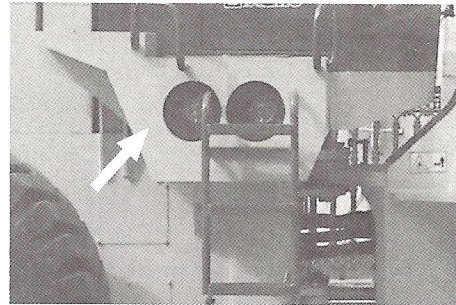


2. Condensator and liquid tank

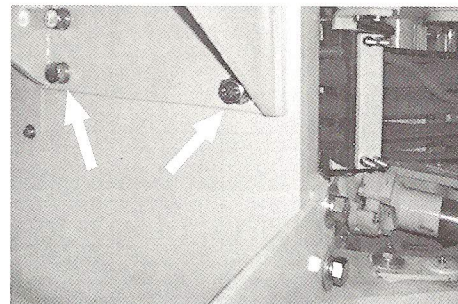
Please refer to the section of "Dismount the A/C unit" for details.

3. Right trestle

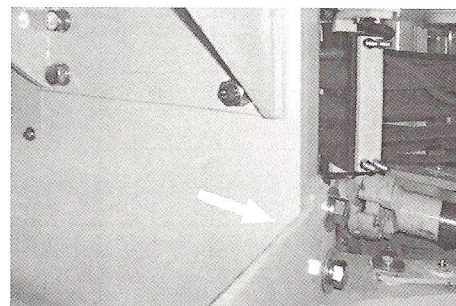
(1) Lift up the right trestle;



(2) Loose the bolts for connecting the right trestle with the machine frame;



(3) Loose the bolts for connecting the ladder with the right trestle and machine frame, take down the ladder.



4. Dismounting and Assembling



(4) Lift the right trestle away from the machine.

 Left and right trestle: 100kg.

Assembling of the right trestle

Adopt the opposite sequences of dismounting for assembling.

Dismounting of the hydraulic oil tank unit

 Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

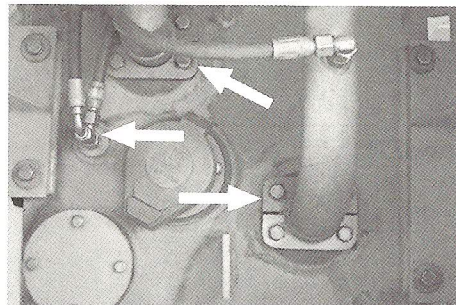
1. Drain away the oil

Loose the plug and drain away the hydraulic oil.



2. Steel pipes of oil inlet and outlet

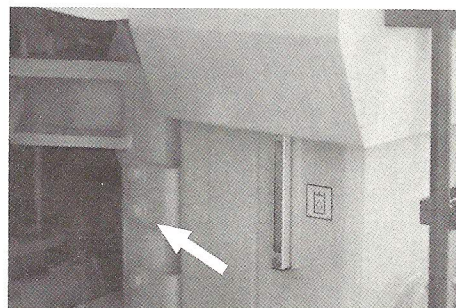
Loose the bolts for connecting the flange, and take down the steel pipes of oil inlet and outlet and hose.



3. Hydraulic oil tank

(1) Lift up the hydraulic oil tank, take down the assembling bolts and then lift the tank away from the machine;

 Hydraulic oil tank: 140kg (empty).



Assembling of the hydraulic oil tank unit

Adopt the opposite sequences of dismounting for assembling.

Dismounting of central pin

⚠ Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

⚠ Release the remnant pressure inside of the pipelines.

Lift up the front part of the bucket for 30 ~ 50mm and down the rear part to the ground by operating the knob, and then stop the engine.

Then check whether the whole underside of the bucket touch the ground or not.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

⚠ Cut off the power from the negative pole of the battery cell.

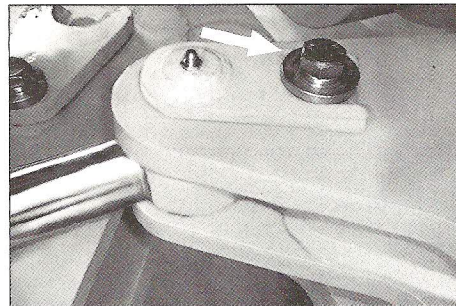
1. Dismount the driver's cab unit

Please refer to the section of "Dismount the driver's cab unit" for details.

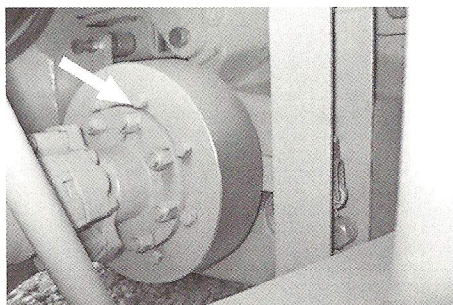
2. Dismount the locking bolt at the end of the lever in the steering cylinder, and then take down the pin

Adopt the same method for both the left and right steering cylinders.

△ Check the quantity and thickness of the pads if necessary and keep them in a safe place.



3. Dismount the connect of the middle transmission shaft

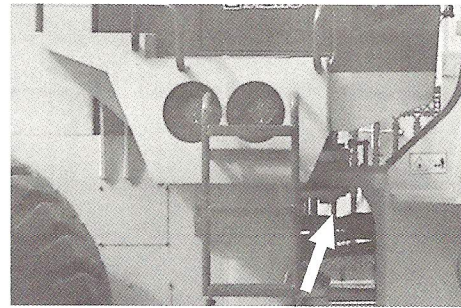


4. Dismounting and Assembling



4. Disconnect the hose and cable wire

- △ Disconnect the hose linking at the end of the rear framework first, and then disconnect the hose linking at the end of the valve.



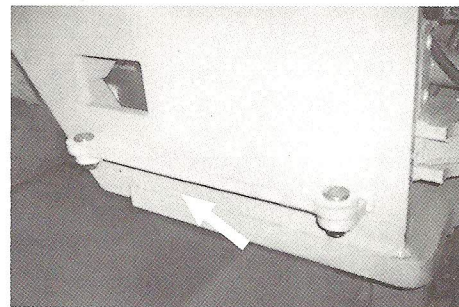
5. Dismount the limit valve

Please refer to the section of "Dismount the limit valve" for details.

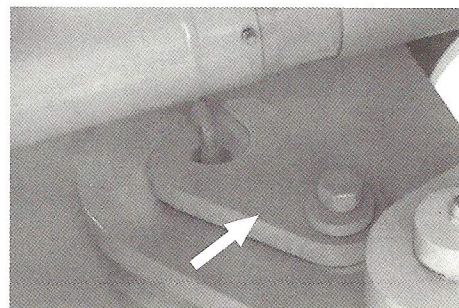
6. Dismount the framework according to the following steps:

- (1) Adjust the height of the rear framework, and place heel blocks under the framework;
 - △ Place the heel blocks under the two sides of the framework.
- (2) Adjust the height of the front framework, and place heel blocks under the framework, then place a roller between the framework and the heel blocks;
 - △ Place heel blocks and rollers under the two sides of the framework.
 - △ Adjust the height of the framework carefully.
- (3) Place a support under the counterweight;
 - △ Block the rear two tyres firmly in case of moving.
 - △ Select a support which is adjustable for its height.

- (4) Take down the locking rod of the framework;



- (5) Take down the assembling bolt at the underside of the pin, then take down the pin from the top;
 - △ Adjust the height of the front and rear framework carefully and then fix the height so the pin can be taken down without forcing.

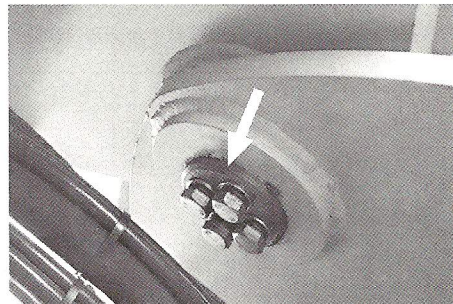


4. Dismounting and Assembling



- (6) Take down the assembling bolt at the upside of the pin, take down the under cover and then take down the assembling pin from the top;

△ Be careful to keep its balance when operating.

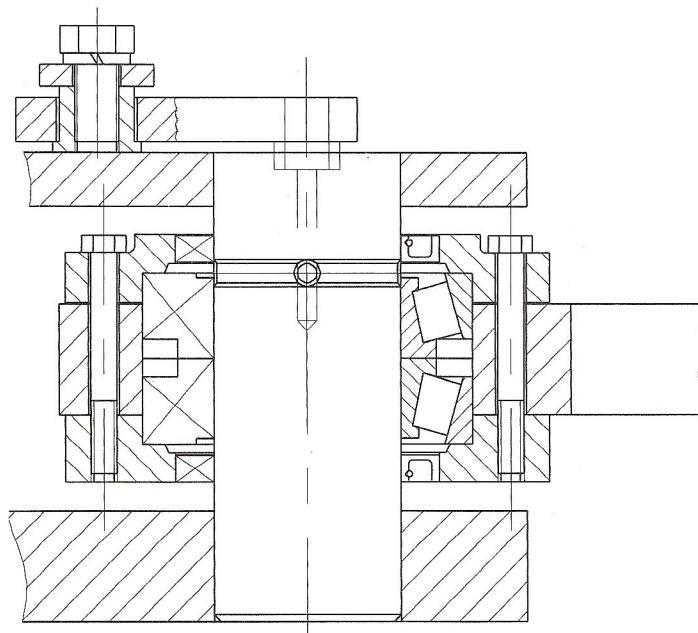


7. Articulated bearing at the under side

- (1) Take down the assembling bolt, spacer and end cover of the bearing, then take down the anti-dust ring from the end cover of the bearing;

△ There are pads between the end cover of the bearing and the front framework, check the quantity and thickness and keep them in a safe place.

- (2) Take down the anti-dust ring from the rear framework;
- (3) Take down the bearing.

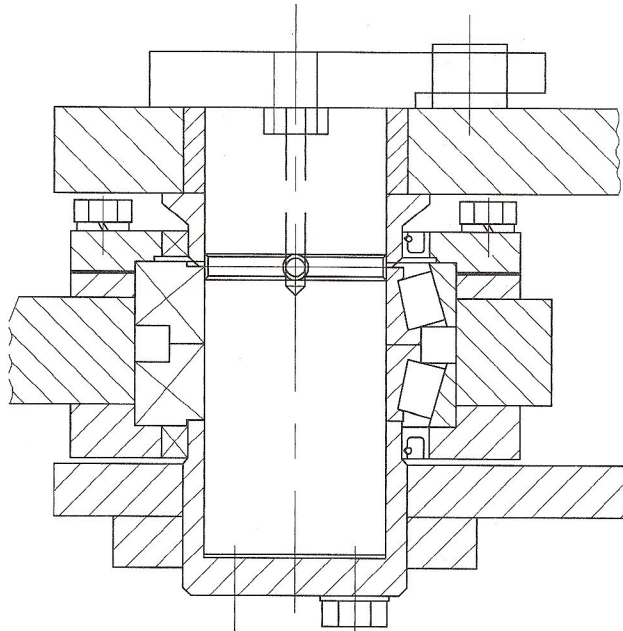


8. Articulated bearing at the upside

- (1) Take down the assembling bolt, spacer and end cover of the bearing, then take down the anti-dust ring from the end cover of the bearing;

△ There are pads between the end cover of the bearing and the front framework, check the quantity and thickness and keep them in a safe place.

- (2) Take down the anti-dust ring from the front framework;
- (3) Take down the bearing.



Assembling of the central pin

Adopt the opposite sequences of dismounting for assembling.

1. Articulated bearing at the underside

- (1) Fix the bearing by pressing with a tool;
 - △ Be careful not to let the bearing be fixed at an angle.
 - △ Spread lots of grease to the inside of the bearing.
- (2) Fix the anti-dust ring by pressing on the end cover of the bearing;
 - △ Change to new anti-dust rings and fix them on by pressing and let the surface of the labial margin towards outside.
- (3) Fasten the end cover with the assembling bolts;
- (4) Fix the anti-dust ring from the underside of the front framework.
 - △ Change to new anti-dust rings and fix them on by pressing and let the surface of the labial margin towards outside.

2. Articulated bearing at the upside

- (1) Fix the bearing by pressing with a tool;
 - △ Be careful not to let the bearing be fixed at an angle.
 - △ Spread lots of grease to the inside of the bearing.
- (2) Fix the anti-dust ring by pressing on the end cover of the bearing;
 - △ Change to new anti-dust rings and fix them on by pressing and let the surface of the labial margin towards outside.

4. Dismounting and Assembling



- (3) Fasten the end cover with the assembling bolts;
- (4) Fix the anti-dust ring from the underside of the front framework.
- △ Change to new anti-dust rings and fix them on by pressing and let the surface of the labial margin towards outside.

3. Connect the framework according to the following steps

- (1) Lift up the front framework with a crane. Then move the front framework towards to the end of the rear framework and align the pin holes;
 - △ Be sure to align the pin holes.
 - ⚠ When aligning the pin holes, a stick should be used instead of your finger.
- (2) Take down the support under the counterweight, and then those under the front and rear framework;
- (3) Fix the locking rod of the framework.

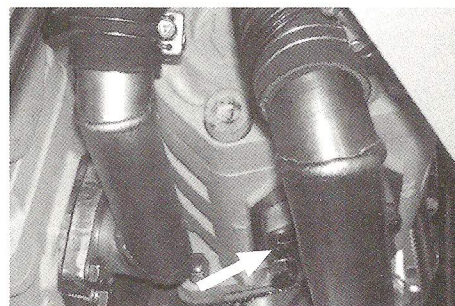
Dismounting of the working pump

- ⚠ Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.
- ⚠ Release the remnant pressure inside of the pipelines.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.
- ⚠ Cut off the power from the negative pole of the battery cell.

1. Steel pipe of oil inlet

Loose the assembling bolts of the divided flange for connecting the steel pipe of oil inlet with the working pump, loose the double steel hoop for connecting the oil inlet pipe with the hose, and then take down the inlet pipe.



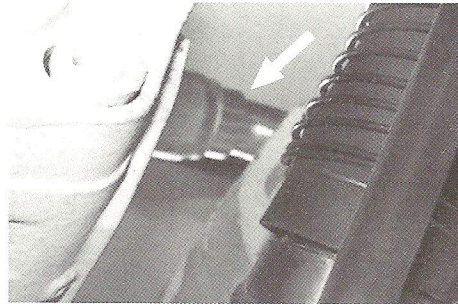
4. Dismounting and Assembling



2. Oil outlet hose

Loose the assembling bolt of the divided flange for connecting the oil outlet hose with the working pump, then take down the oil outlet hose;

- △ Insert a plug to the hose after disconnecting in case any dust may come inside.
- △ Tie a label on the hose after disconnection for future identification.



3. Seat

Take down the seat.

Please refer to the section of "Dismounting of the cab unit" for details

4. Working pump

- (1) At the position of dismounting the seat, lift up the working pump with nylon lifting tools;
 - (2) Take down the assembling bolt and lift the pump away from the machine. Be careful to keep its balance.
- △ Special attention should be paid when doing this operation because of narrow space.
 - △ Any component should be dismounted by at least two workers together.



 Working pump: 37kg.

Assembling of the working pump

Adopt the opposite sequences of dismounting for assembling.

- △ Place the O-ring into the slot firmly and be careful not to lock it when assembling.
- △ Do not twist or enwind the hoses when assembling.

Re-fill with oil

Re-fill the hydraulic oil through the filler to the required level.

- △ Run the engine to circulate the oil in the system and then check the oil level again.
- △ Exhaust the pipe after assembling.

Dismounting of the multi-path steering valve

! Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

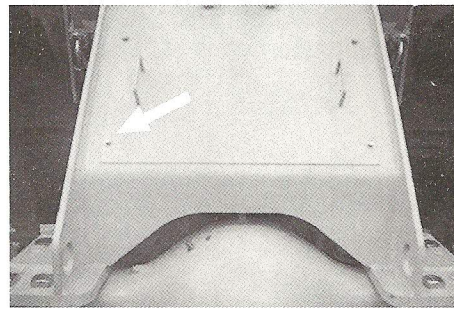
! Release the remnant pressure inside of the pipelines.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

! Cut off the power from the negative pole of the battery cell.

1. Lift up the boom, and place a support under the boom, then take down the assembling face plate of the front framework.

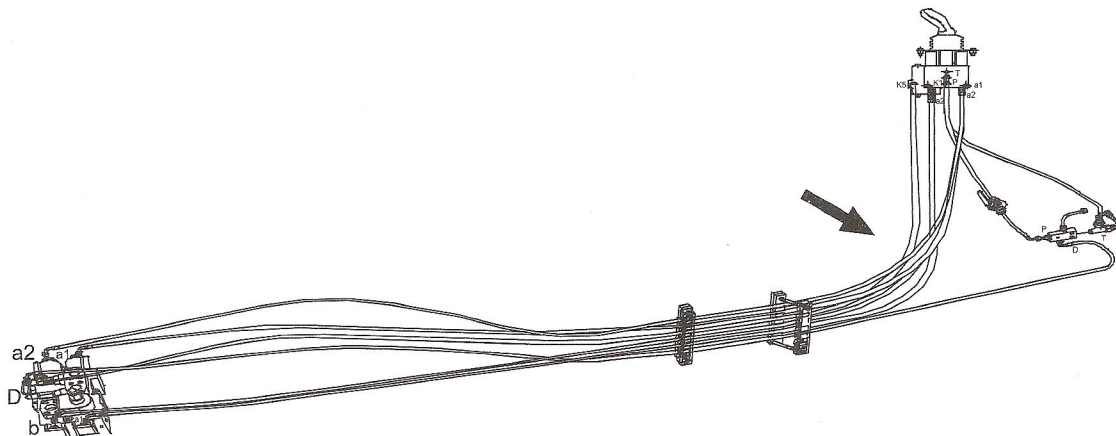
! Place the support firmly.



2. Hydraulic pipelines

Disconnect the following hydraulic pipelines from the multi-path steering valve:

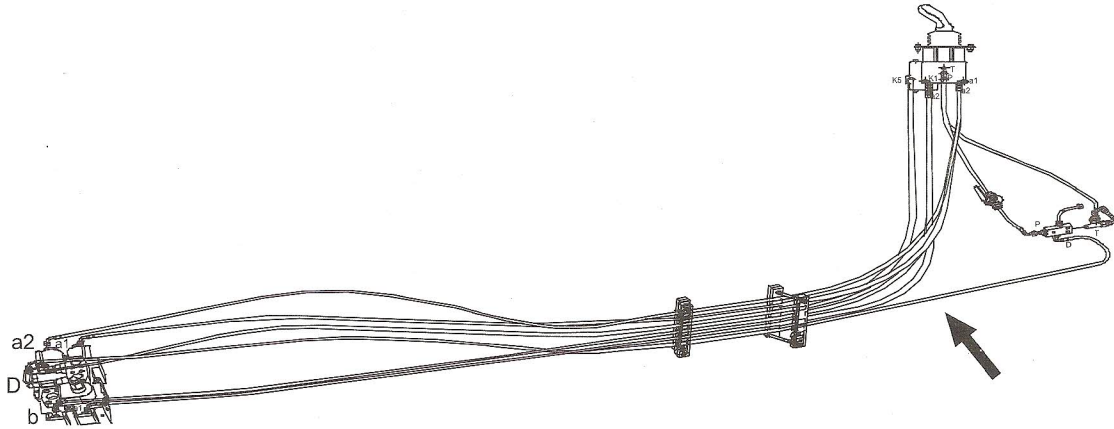
Pipelines between the multi-path steering valve and the leading valve, 5 pieces in total.



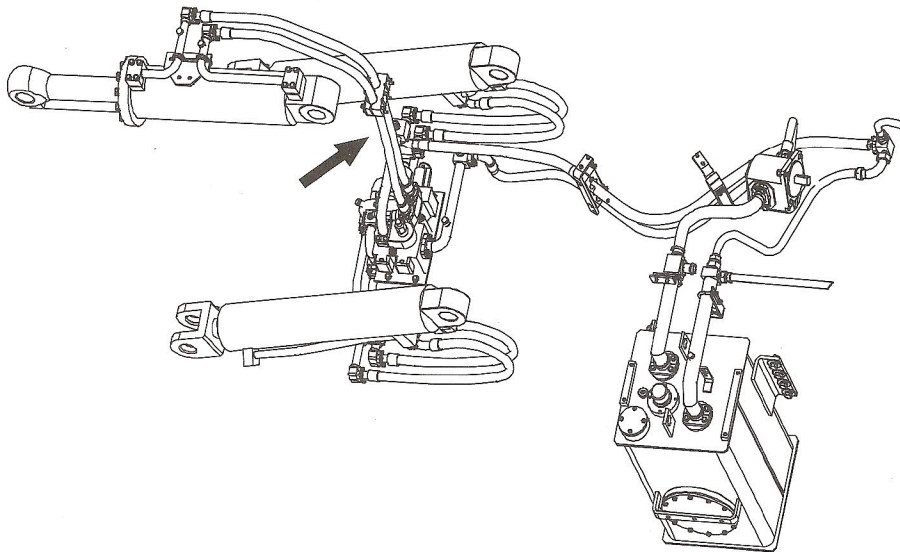
4. Dismounting and Assembling



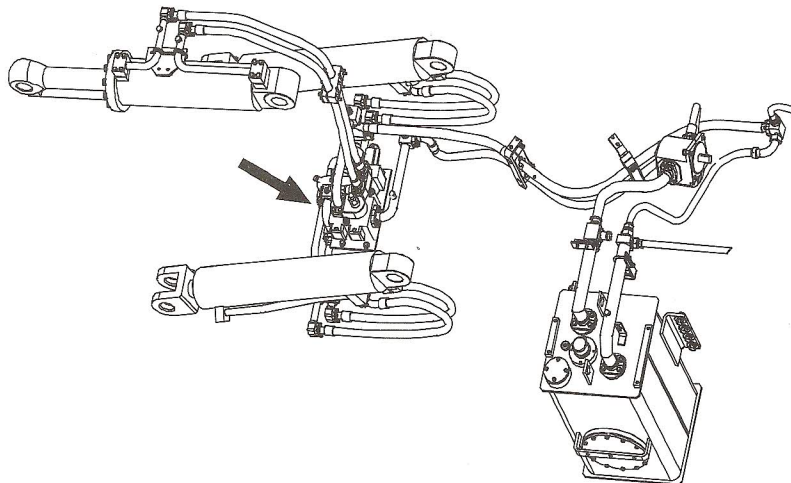
Pipeline between the multi-path steering valve and the selecting valve, 1 piece in total.



Pipelines between the multi-path valve and the tilt cylinder, 2 pieces in total.



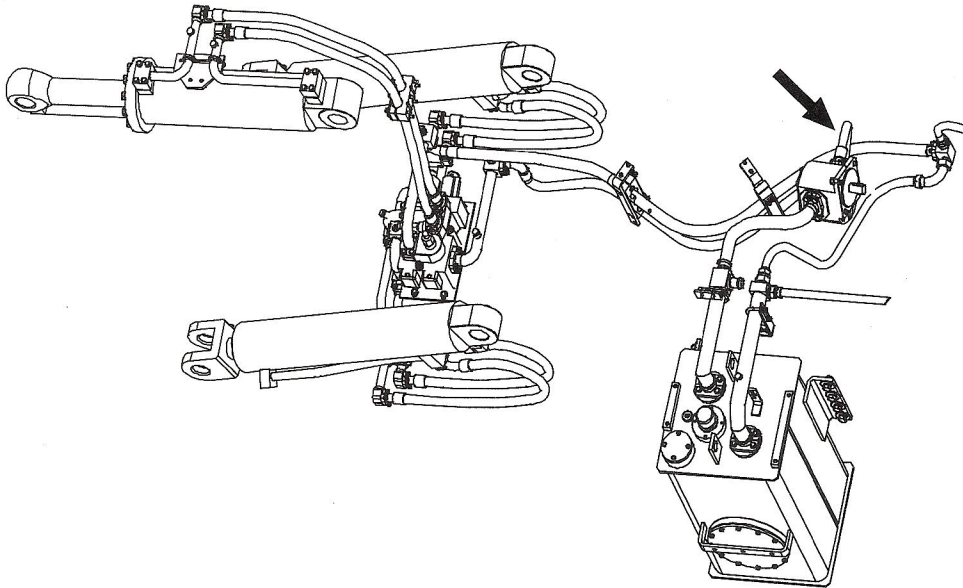
Pipelines between the multi-path steering valve and the left and right lifting cylinder, 2 pieces in total.



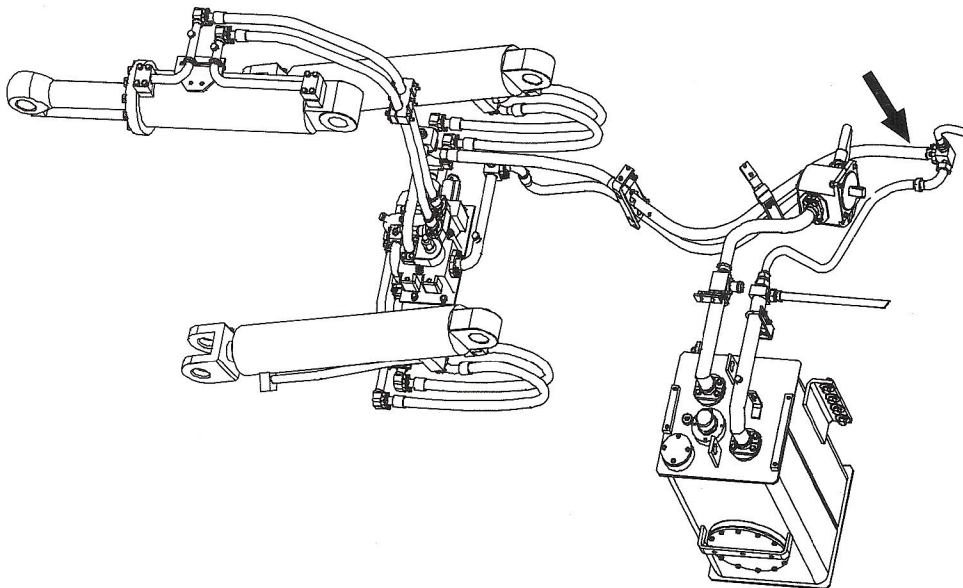
4. Dismounting and Assembling



Oil inlet pipeline between the multi-path steering valve and the working pump, 1 piece in total.



Oil outlet pipeline between the multi-path steering valve and the hydraulic oil radiator, 1 piece in total.

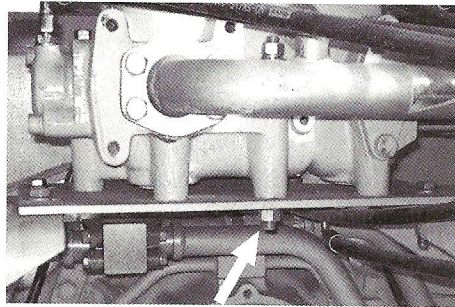


- △ When there is a steel pipe or connector for transition between pipelines, dismount the steel pipe or connector first.
- △ Insert a plug into the hose after dismounting in case any dust may come inside.
- △ Tie a label on the hose after disconnecting for future identification.

3. Lift up the multi-path steering valve, take down the assembling bolts and then lift it away from the machine

 Multi-path steering valve: 100kg.

 The above mentioned operation should be finished by two workers together.



Dismounting of the two-way flow pump of leading and steering

 Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

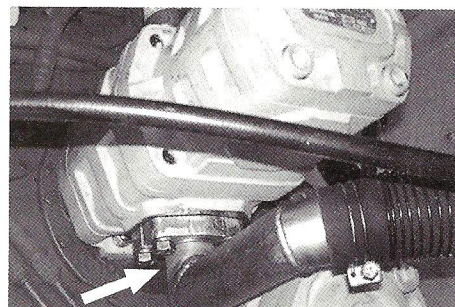
 Release the remnant pressure inside of the pipelines.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

 Cut off the power from the negative pole of the battery cell.

1. Steel pipe of oil inlet

Loose the assembling bolts of the divided flange for connecting the steel pipe of oil inlet with the two-way flow pump of leading and steering, loose the double steel hoop for connecting the oil inlet pipe with the hose, and then take down the inlet pipe;



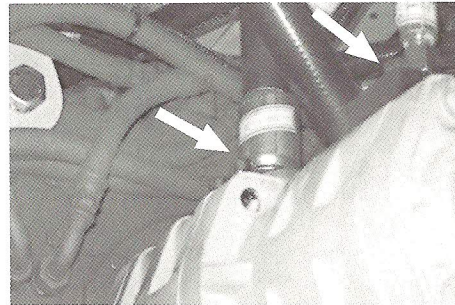
4. Dismounting and Assembling



2. Oil outlet hose

Loose the assembling bolt of the divided flange for connecting the oil outlet hose with the two-way flow pump, then take down the oil outlet hose;

- △ Insert a plug to the hose after disconnecting in case any dust may come inside.
- △ Tie a label on the hose after disconnection for future identification.



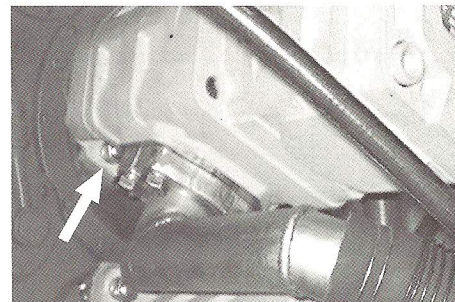
3. Seat

Take down the seat.

Please refer to the section of "Dismounting of the cab unit" for details.

4. Two-way flow pump of leading and steering

- (1) At the position of dismounting the seat, lift up the two-way flow pump with nylon lifting tools;
 - (2) Take down the assembling bolt and lift the pump away from the machine. Be careful to keep its balance.
- △ Special attention should be paid when doing this operation because of narrow space.
 - △ Every component should be dismantled by at least two workers together.



 Two-way flow pump of leading and steering: 39kg.

Assembling of the two-way flow pump of leading and steering

Adopt the opposite sequences of dismounting for assembling.

- △ Place the O-ring into the slot firmly and be careful not to lock it when assembling.
- △ Do not twist or enwind the hoses when assembling.

Re-fill with oil

Re-fill the hydraulic oil through the filler to the required level.

- △ Run the engine to circulate the oil in the system and then check the oil level again.
- △ Exhaust the pipe after assembling.

Dismounting of flow amplifier valve

 Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

 Release the remnant pressure inside of the pipelines.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

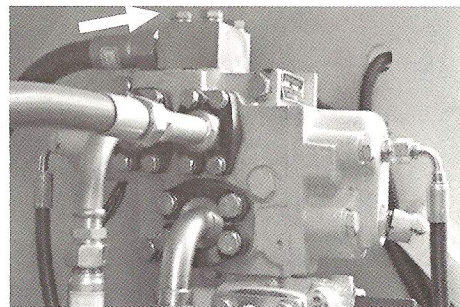
 Cut off the power from the negative pole of the battery cell.

1. Lift up the flow amplifier valve with nylon lifting tools

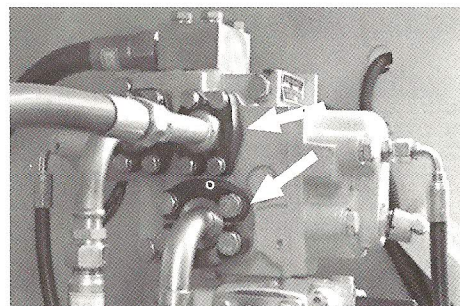
2. Hydraulic pipelines

Disconnect the following hydraulic pipelines from the flow amplifier valve:

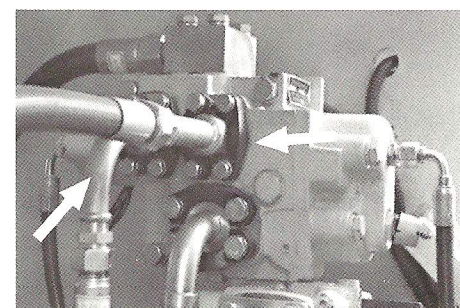
Oil return pipeline between the flow amplifier valve and the multi-path steering valve, 1 piece in total.



Oil inlet pipe between the flow amplifier valve and the two-way flow pump of leading and steering, 1 piece in total.



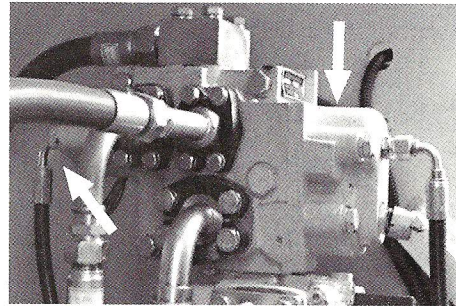
Pipelines between the flow amplifier valve and the steering cylinder, 2 pieces in total.



4. Dismounting and Assembling



Pipelines between the flow amplifier valve and the steering limit valve, 2 pieces in total.



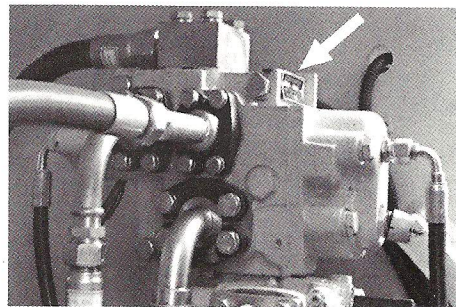
- △ When there is a steel pipe or connector for transition between pipelines, dismount the steel pipe or connector first.
- △ Insert a plug into the hose after dismounting in case any dust may come inside.
- △ Tie a label on the hose after disconnecting for future identification.

3. Flow amplifier valve

Lift up the flow amplifier valve, take down the assembling bolts and then lift it away from the machine.

 Flow amplifier valve: 23 kg

- △ The above mentioned operation should be finished by two workers together.



Assembling of the flow amplifier valve

Adopt the opposite sequences of dismounting for assembling.

- △ Place the O-ring into the slot firmly and be careful not to lock it when assembling.
- △ Do not twist or enwind the hoses when assembling.

Re-fill with oil

Re-fill the hydraulic oil through the filler to the required level.

- △ Run the engine to circulate the oil in the system and then check the oil level again.
- △ Exhaust the pipelines after assembling.

Dismounting of limit valve

-  Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

4. Dismounting and Assembling



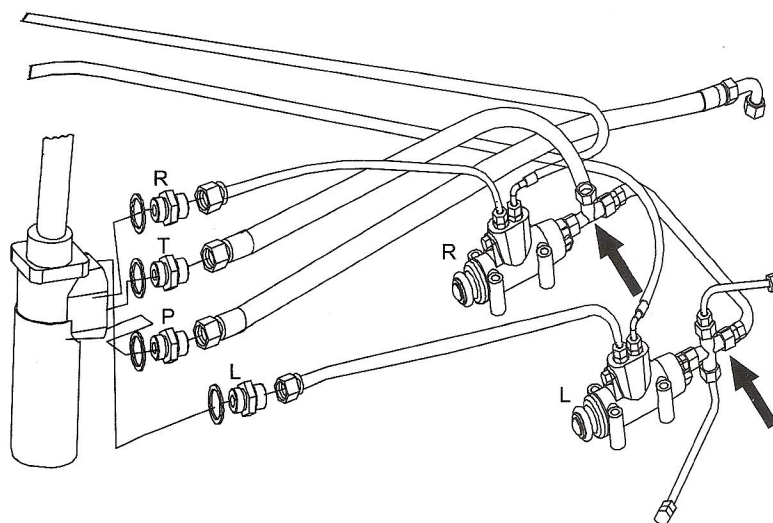
! Release the remnant pressure inside of the pipelines.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

! Cut off the power from the negative pole of the battery cell.

1. Connectors

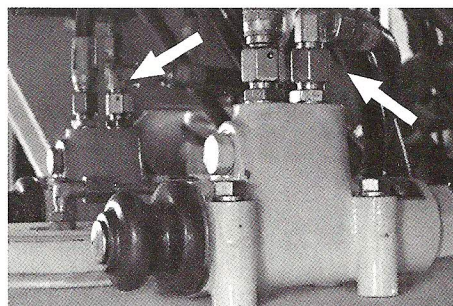
Dismount the connectors for linking with the limit valve.



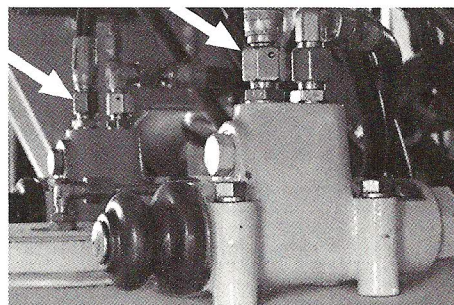
2. Hydraulic pipelines

Disconnect the following hydraulic pipelines from the limit valve:

Pipelines between the limit valve and the flow amplifier valve,
2 pieces in total.



Pipelines between the limit valve and the steering-gear, 2
pieces in total.



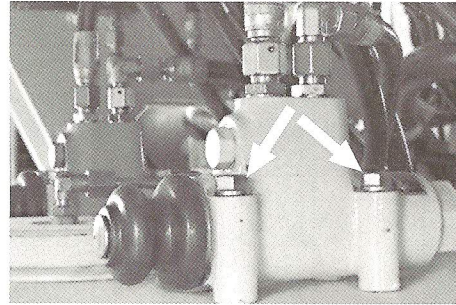
4. Dismounting and Assembling



- △ Insert a plug to the hose after disconnecting in case any dust may come inside.
- △ Tie a label on the hose after disconnection for future identification

3. Limit valve

Loose the assembling bolts for connecting the limit valve with the articulated plate of the rear framework, then take down the limit valve.



Assembling of the limit valve

Adopt the opposite sequences of dismounting for assembling.

- △ Place the O-ring into the slot firmly and be careful not to lock it when assembling.
- △ Do not twist or enwind the hoses when assembling.

Re-fill with oil

Re-fill the hydraulic oil through the filler to the required level.

- △ Run the engine to circulate the oil in the system and then check the oil level again.
- △ Exhaust the pipelines after assembling.

Dismounting of the select valve

⚠ Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

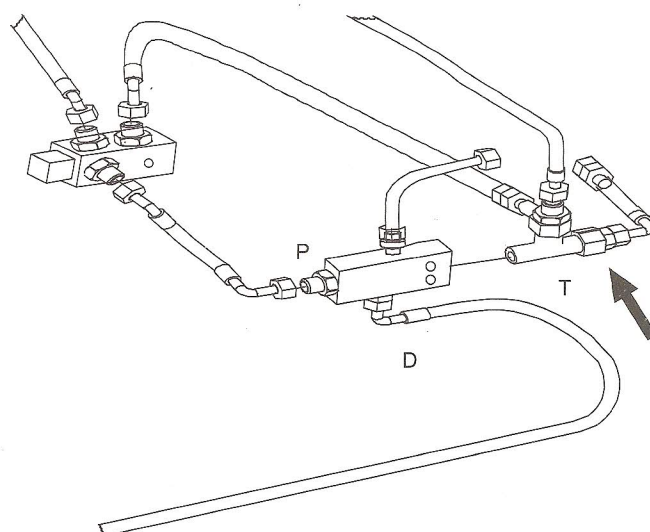
⚠ Release the remnant pressure inside of the pipelines.

Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

⚠ Cut off the power from the negative pole of the battery cell.

1. Connectors

Dismount the connects for linking with the select valve;



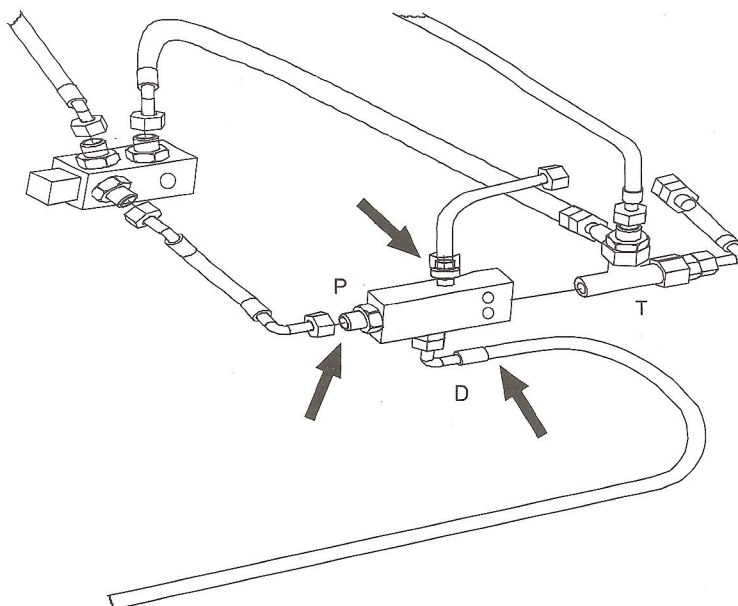
2. Hydraulic pipelines

Disconnect the following hydraulic pipelines from the select valve:

Pipeline between the select valve and the ball valve, 1 piece in total.

Pipeline between the select valve and the multi-path steering valve, 1 piece in total.

Pipeline between the select valve and the two-way flow valve of leading and steering, 1 piece in total.



△ Insert a plug into the hose after dismounting in case any dust may come inside.

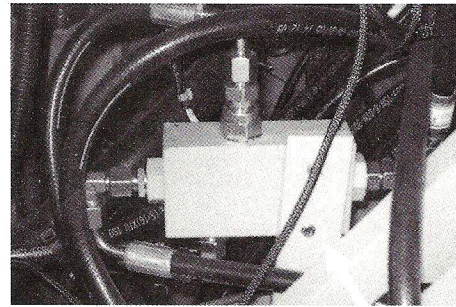
△ Tie a label on the hose after disconnecting for future identification.

4. Dismounting and Assembling



3. Select valve

Loose the assembling bolts for connecting the select valve with the rear framework, then take down the select valve.



Assembling of the select valve

Adopt the opposite sequences of dismounting for assembling.

- △ Place the O-ring into the slot firmly and be careful not to lock it when assembling.
- △ Do not twist or enwind the hoses when assembling.

Re-fill with oil

Re-fill the hydraulic oil through the filler to the required level.

- △ Run the engine to circulate the oil in the system and then check the oil level again.

Dismounting of the leading valve

- ⚠ Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.
- ⚠ Release the remnant pressure inside of the pipelines.
Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.
- ⚠ Cut off the power from the negative pole of the battery cell.

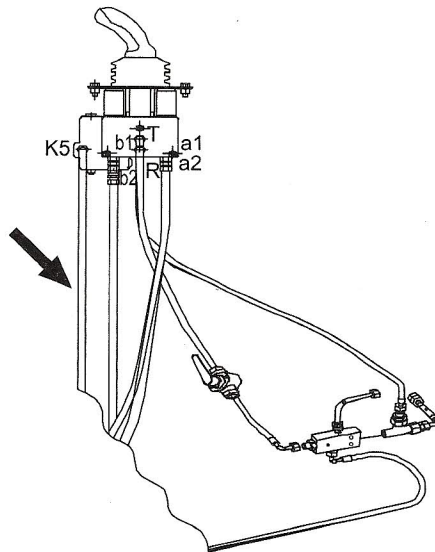
1. Open the side door of the controlling box in the cab

2. Hydraulic pipelines

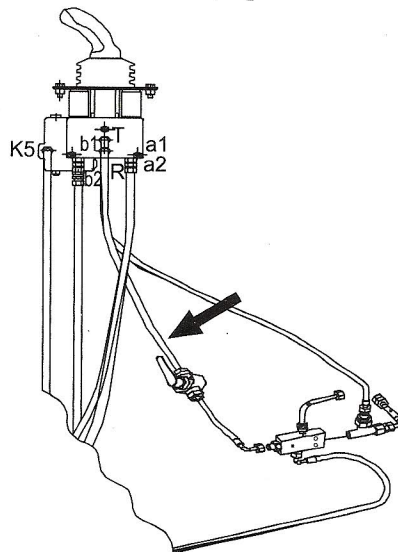
Disconnect the following hydraulic pipelines from the leading valve:

Pipelines between the leading valve and the multi-path steering valve, 5 pieces in total.

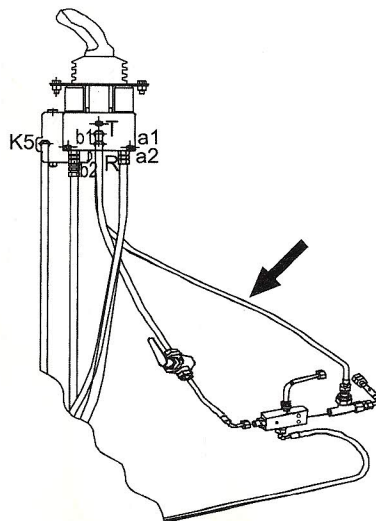
4. Dismounting and Assembling



Pipeline between the leading valve and the ball valve, 1 piece in total.



Oil return pipeline of the leading valve, 1 piece in total.



4. Dismounting and Assembling

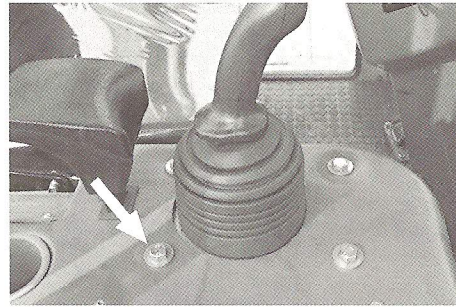
- △ Insert a plug into the hose after dismounting in case any dust may come inside.
- △ Tie a label on the hose after disconnecting for future identification.

3. Controlling knob

Loose the fastening bolts of the controlling knob, and then take down the knob.

4. Leading valve

Loose the assembling bolts for connecting the leading valve with the controlling box, and then take down the leading valve from the side door.



Assembling of the leading valve

Adopt the opposite sequences of dismounting for assembling.

- △ Place the O-ring into the slot firmly and be careful not to lock it when assembling.
- △ Do not twist or enwind the hoses when assembling.

Re-fill with oil

Re-fill the hydraulic oil through the filler to the required level.

- △ Run the engine to circulate the oil in the system and then check the oil level again.
- △ Exhaust the pipelines after assembling.

Dismounting of the leading overflow valve

- ⚠ Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.
- ⚠ Release the remnant pressure inside of the pipelines.
Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.
- ⚠ Cut off the power from the negative pole of the battery cell.

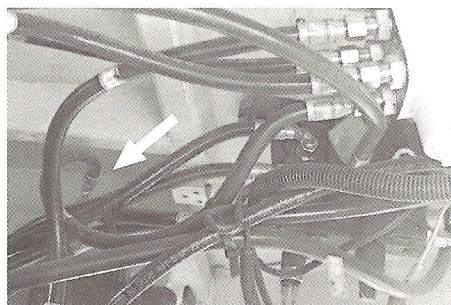
1. Hydraulic pipelines

Disconnect the following hydraulic pipelines from the leading overflow valve:

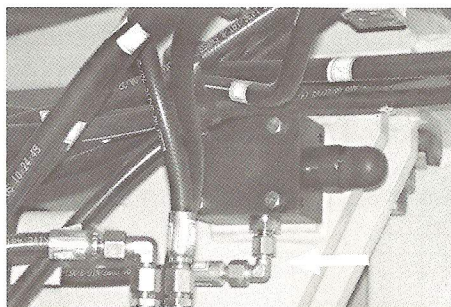
4. Dismounting and Assembling



Pipeline between the leading overflow valve and the leading pump, 1 piece in total.



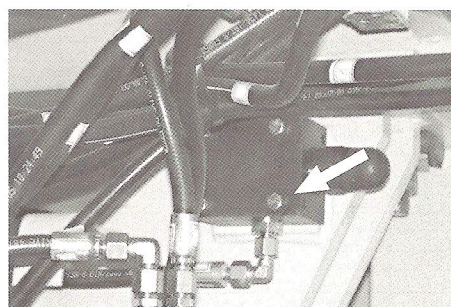
Oil return pipeline of the leading overflow valve, 1 piece in total.



- △ Insert a plug into the hose after dismounting in case any dust may come inside.
- △ Tie a label on the hose after disconnecting for future identification.

2. Leading overflow valve

Loose the assembling bolts of the leading overflow valve, and then take down the valve.



Assembling of the leading overflow valve

Adopt the opposite sequences of dismounting for assembling.

- △ Place the O-ring into the slot firmly and be careful not to lock it when assembling.
- △ Do not twist or enwind the hoses when assembling.

Re-fill with oil

Re-fill the hydraulic oil through the filler to the required level.

- △ Run the engine to circulate the oil in the system and then check the oil level again.
- △ Exhaust the pipelines after assembling.

Dismounting of the steering-gear

⚠ Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

⚠ Release the remnant pressure inside of the pipelines.

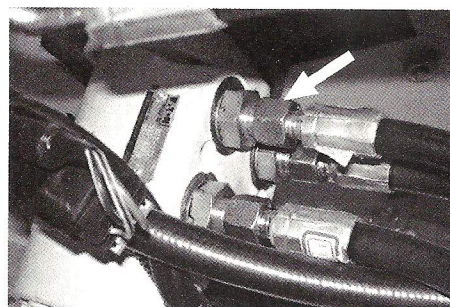
Turn the filler cap of the hydraulic oil tank slowly to release the inside pressure. Then operating the knob for several times to release the remnant pressure in the hydraulic pipelines.

⚠ Cut off the power from the negative pole of the battery cell.

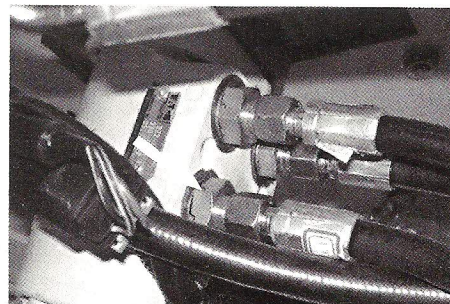
1. Hydraulic pipelines

Disconnect the following pipelines from the steering-gear:

Hoses between the steering-gear and the limit valve, 2 pieces in total.



Oil inlet and outlet hoses of the steering-gear, 2 pieces in total.

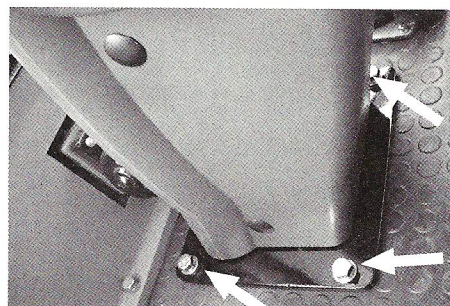


△ Insert a plug into the hose after dismounting in case any dust may come inside.

△ Tie a label on the hose after disconnecting for future identification.

2. Steering-gear

Loose the bolts for connecting the steering column with the floor of the cab, and then take down the steering-gear.



4. Dismounting and Assembling

Assembling of the steering-gear

Adopt the opposite sequences of dismounting for assembling.

Re-fill with oil

Re-fill the hydraulic oil through the filler to the required level.

- △ Run the engine to circulate the oil in the system and then check the oil level again.
- △ Exhaust the pipelines after assembling.

Dismounting of the brake valve

⚠ Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

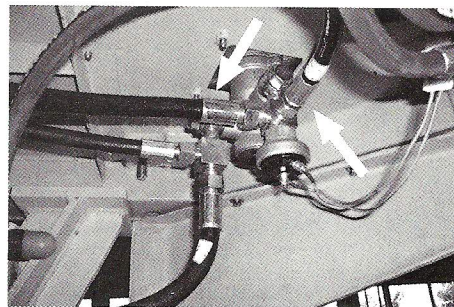
⚠ Release the remnant pressure inside of the pipelines.

Turn on the power, step down the brake pedal slowly and repeatedly until the brake air pressure give out alarm, then cut off the electrical power. Loose the exhausting bolts on front and rear axle brake to release the brake oil pressure.

⚠ Cut off the power from the negative pole of the battery cell.

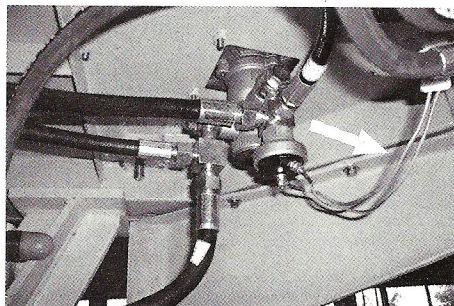
1. Pipelines

Disconnect the hoses and connectors which connecting with brake valve.



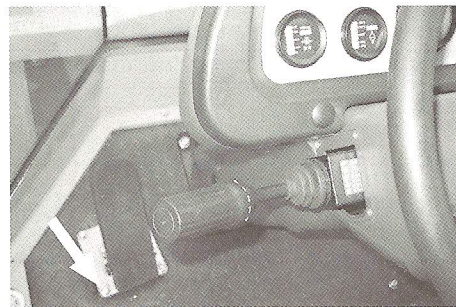
2. Electrical wires

Disconnect the connection with the pressure sensor of foot brake valve.



3. Brake valve

Loose the nuts of the assembling bolts of the brake valve under the floor of the cab, and then take down the brake valve.



Assembling of the brake valve

Adopt the opposite sequences of dismounting for assembling.

Dismounting of combination valve of oil-water separator

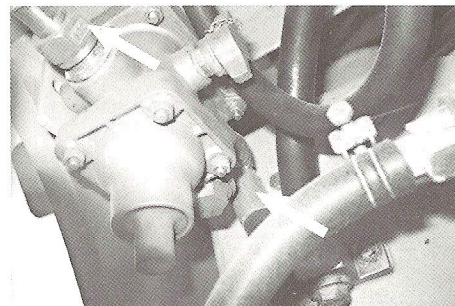
 Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

 Release the remnant pressure inside of the pipelines.

Turn on the power, step down the brake pedal slowly and repeatedly until the brake air pressure give out alarm, then cut off the electrical power.

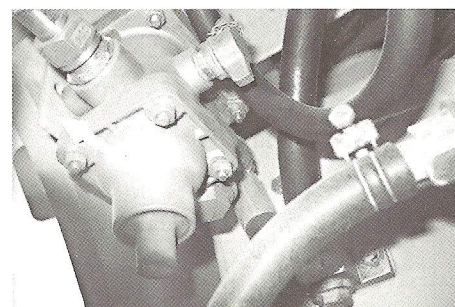
1. Pipeline

Disconnect the hose and connectors which connecting with the combination valve of oil-water separator.



2. Combination valve of oil-water separator

Loose the bolts for assembling the combination valve of oil-water separator, then take down the combination valve of oil-water separator.



Assembling of the combination valve of oil-water separator

Adopt the opposite sequences of dismounting for assembling.

Dismounting of air reservoir

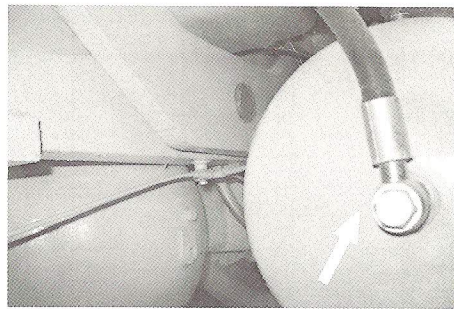
 Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

 Release the remnant pressure inside of the pipelines.

Turn on the power, step down the brake pedal slowly and repeatedly until the brake air pressure give out alarm, then cut off the electrical power.

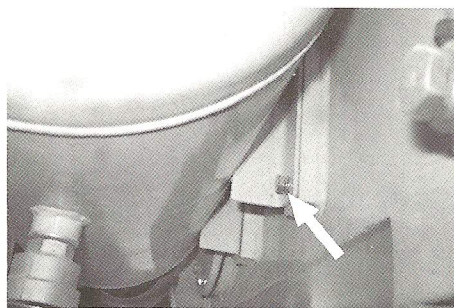
1. Pipeline

Disconnect the hoses and connectors which connected with air reservoir.



2. Air reservoir

Loose the bolts for assembling the air reservoir then take down the air reservoir.



Assembling of the air reservoir

Adopt the opposite sequences of dismounting for assembling.

Dismounting of brake cylinder

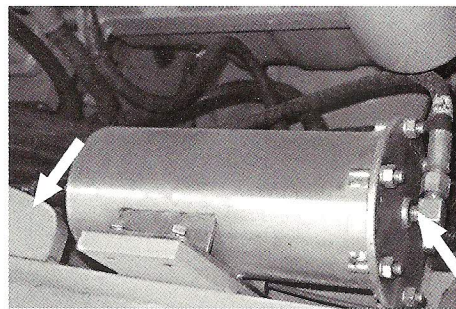
! Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

! Release the remnant pressure inside of the pipelines.

Turn on the power, step down the brake pedal slowly and repeatedly until the brake air pressure give out alarm, then cut off the electrical power.

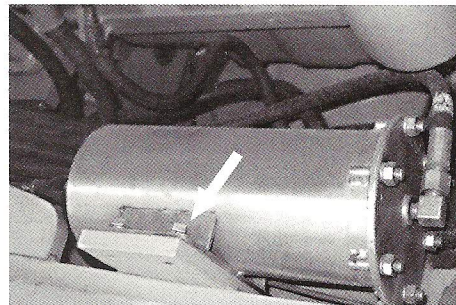
1. Pipeline

Disconnect the hoses and cable which connected with brake cylinder.



2. Brake cylinder

Loose the bolts for assembling the brake cylinder, then take down the brake cylinder.



Assembling of brake cylinder

Adopt the opposite sequences of dismounting for assembling.

Dismounting of boost pump unit

Stop the loader on a horizontal ground, connect the locking rod of the framework, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.

4. Dismounting and Assembling



Release the remnant pressure inside of the pipelines.

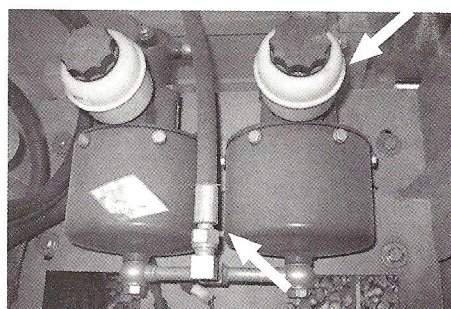
Turn on the power, step down the brake pedal slowly and repeatedly until the brake air pressure give out alarm, then cut off the electrical power.



Cut off the power from the negative pole of the battery cell.

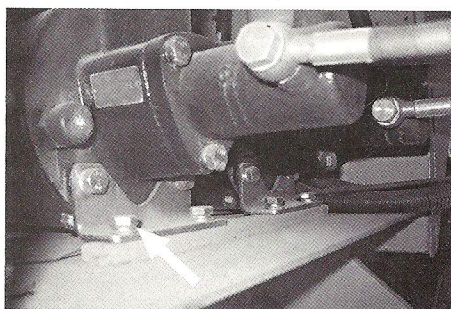
1. Pipeline

Disconnect the hose which connected with boost pump.



2. Boost pump

Loose the bolts for assembling the boost pump, then take down the boost pump.



Dismounting of the driver's cab



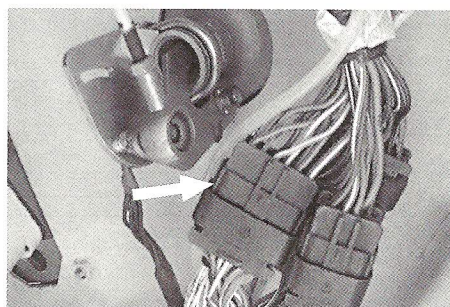
Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.



Cut off the power from the negative pole of the battery cell.

1. Electrical wires

Disconnect the wire connectors of the cab.

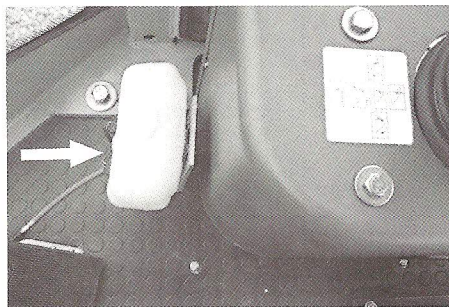


4. Dismounting and Assembling



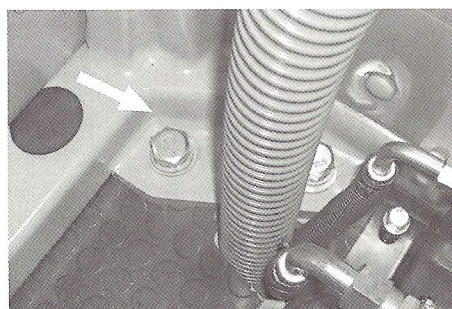
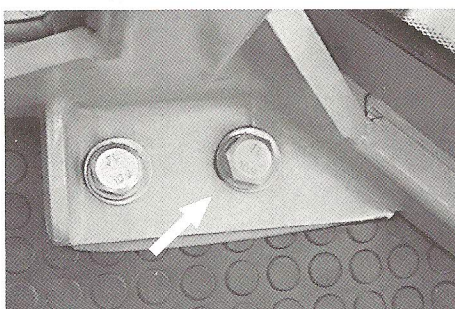
2. Spray kettle

Disconnect the wires and water pipe connector between front and rear rain wiper and spray kettle.



3. Driver's cab

(1) Take down the assembling bolts for connecting the cab with the framework;



(2) Lift up the cab horizontally with lifting tools crossing the four lifting bolts at the top of the cab and then lift it away from the machine slowly.



4. Seat

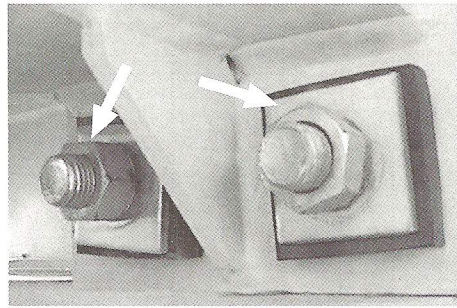
Loose the bolts for assembling the seat and the cab base, then take down the seat.



4. Dismounting and Assembling

5. Base

If it is necessary to dismount the base, please take down the bolts for assembling the base and the framework, disconnect relative wires and hoses, lift the base away slowly.



Assembling of the driver's cab

Adopt the opposite sequences of dismounting for assembling.

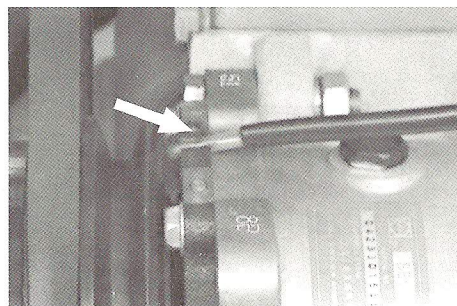
△ Connect the electrical wires firmly.

Dismounting of the A/C

- ⚠ Stop the loader on a horizontal ground, lower the bucket to the ground and stop the engine. Use the parking brake and place a wedge behind the wheels to prevent the machine from moving.
- ⚠ Open the engine hood and lock it.
- ⚠ Cut off the power from the negative pole of the battery cell.
- ⚠ Cold-producing medium may cause blind if it comes into your eye incauciously. Therefore, put on the goggles when doing this operation.

1. Compressor

- (1) Return oil in the compressor, then drain out the cold-producing medium from the high pressure filler valve and low pressure filler valve of the compressor with a manifold pressure gauge;

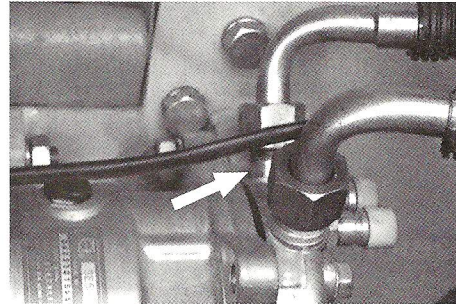


- (2) Disconnect the electrical wire from the connector;

4. Dismounting and Assembling

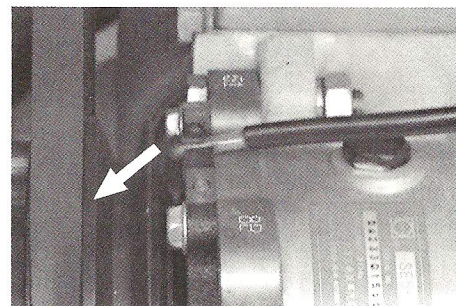


- (3) Dismount the hose;



- △ Place a cover on the hose after disconnecting in case any dirt, dust or water may come inside of the connector.

- (4) Loose the bolt, take down the V-belt, and then dismount the compressor.



2. Liquid tank

- (1) Loose the bolts of the assembling bracket for connecting the liquid tank with the right trestle, and then take down the tank;



- (2) Disconnect the power connector; dismount the hose.

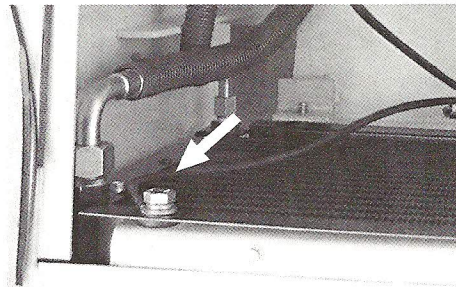


4. Dismounting and Assembling

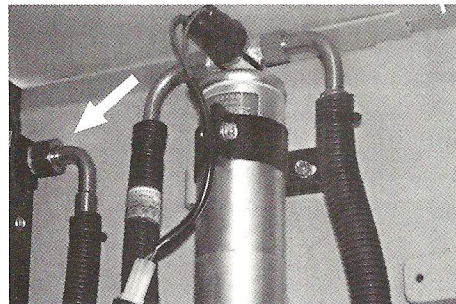
- △ Place a cover on the hose after disconnecting in case any dirt, dust or water may come inside of the connector.

3. Condensator

- (1) Open the cover on the right trestle, loose the bolts for fixing the condensator, and then take down the condensator;



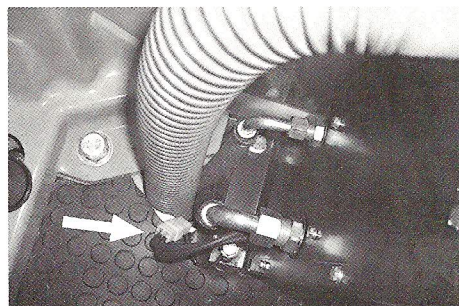
- (2) Dismount the hose.



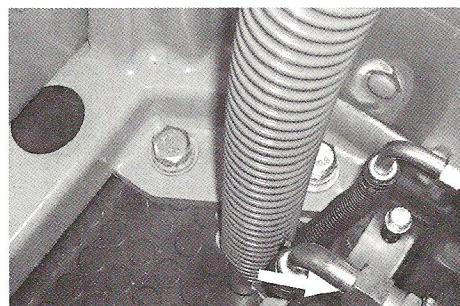
- △ Place a cover on the hose after disconnecting in case any dirt, dust or water may come inside of the connector.

4. Evaporator

- (1) Cut off the power from the connector;



- (2) Disconnect separately the two freezing hoses connecting with evaporator.

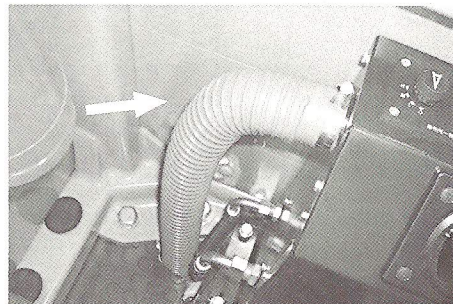


4. Dismounting and Assembling



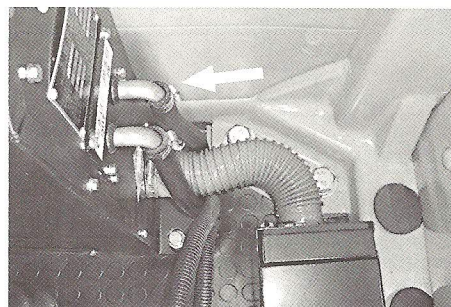
- △ Place a cover on the hose after disconnecting in case any dirt, dust or water may come inside of the connector.

- (3) Loose the hoops and dismount the two hoses connecting with the evaporator;



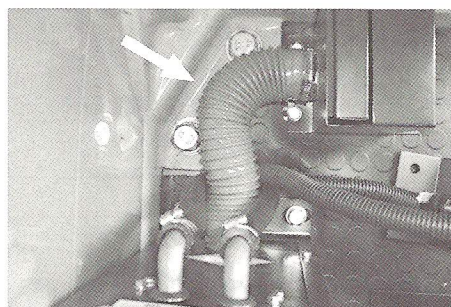
- △ Place a cover on the hose after disconnecting in case any dirt, dust or water may come inside of the connector.

- (4) Loose the hoop and dismount the aeration hose connecting with evaporator;



- △ Place a cover on the hose after disconnecting in case any dirt, dust or water may come inside of the connector.

- (5) Loose the hoop and dismount the aeration hose connecting with evaporator;



- △ Place a cover on the hose after disconnecting in case any dirt, dust or water may come inside of the connector.

4. Dismounting and Assembling



- (6) Loose the bolts for connecting the evaporator with cab base, then take down the evaporator.



Assembling of the A/C

Adopt the opposite sequences of dismounting for assembling.

- △ Inflate gaseous cold-producing medium into the A/C (R134a).
- △ Before inflating, evacuate the A/C with the method of repeating evacuation.
- △ Before re-inflating the cold-producing medium, do not operate the compress.
- △ Check whether the inflating amount of the cold-producing medium is correct.
- △ Check the oil level of the compressor.

5. Test And Adjustment

General Notes

-  When making tests, adjustments and trouble-shootings, park the machine onto a flat area and take safety measures to support the machine frame and block the machine tires to prevent the machine from moving.
-  When working with other crews, use the signals that everybody understands, and bear it in mind that none-relative personnel is not allowed to get close to the machine.
-  When checking the water level inside the water tank, you must wait for a while till the water gets cold. If removing the radiator cover while the water being still very hot, it will lead burning wounds possibly caused by spraying hot water.
-  Care should be taken to prevent being twisted by the fan, belt and other turning parts.
-  The general test and adjustment process and methods as outlined in this chapter only serve as the reference for machine operators and its service people. All the testing tools or measurement apparatus that are supposed to be involved into such test and adjustment will only be supplied by the customers themselves.
-  The charts or diagram as shown in this chapter are only serving as a kind of reference to illustrate the process and method of such test and adjustment, which don't mean the machine itself.
-  As for the test and adjustment methods of some working mechanism and system, please see the corresponding specific components manuals.
-  As regarding the testing port of the machine engine, please see specific engine model.

Measure Engine Rotation Speed

-  When dismounting or installing a measuring device, care should be taken not to touch the high temperature parts.
-  Before making such measurement, make sure there is nobody around the moving parts.

5. Test And Adjustment



△ Engine rotation speed should be measured under the following condition:

- Coolant temperature: Within normal working temperature range.
- Hydraulic oil temperature: 45-55°C.
- Oil temperature in the torque converter: 60-80°C.

(1) Remove the cover (1).

△ Remove or install the cover (1) with a spanner (See Fig. 05-01).

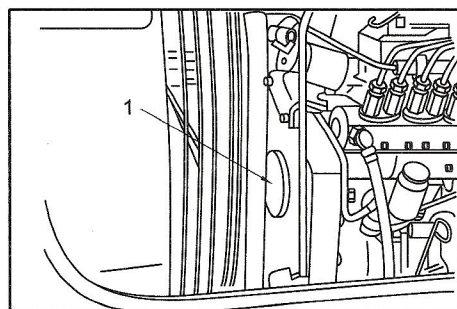


Fig. 05-01

(2) Install a connector A2, then connect it with the tachometer A1 (Please see Fig.05-02, 05-03).

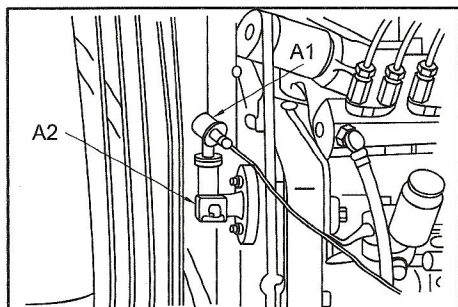


Fig. 05-02

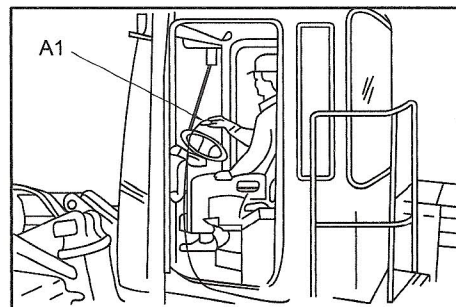


Fig. 05-03

(3) Start up the engine and adjust the above-mentioned measurement condition. Afterwards, start to measure the engine rotation speed.

1) Measure the idle speed specifically at high speed and low speed.

Measure the rotation speed specifically when the accelerator pedal is positioned at low idle speed or high idle speed.

2) Measure the speed of the engine in case the torque converter only with power input but without power output:

5. Test And Adjustment

- a. Pull the parking brake.
- b. Disconnect the gearbox power output and tightly step down the foot brake.
- c. Put the gear selector joystick at Forward 4-gear position.
- d. Run engine run to full throttle, and measure the engine speed when the torque converter is at stall.

! After stepping down the foot brake pedal firmly, step down the accelerator pedal slowly to check and make sure the machine will not move when making such measurement.

- 3) Measure the engine speed in case the hydraulic system is under maximum load.

Run the engine to full throttle, and measure the engine speed while hydraulic fluid returns to relieve pressure in the lift and tilt cylinders fully extended.

- 4) Measure the engine speed while the torque converter is at stall and hydraulic system under maximum load:
 - a. Pull the parking brake.
 - b. Disconnect the gearbox power output and tightly step down the foot brake.
 - c. Put the gear selector joystick at Forward 4-gear position.
 - d. Let the engine run at its maximum acceleration, and measure the engine speed while the torque converter is at stall and hydraulic fluid returns to relieve pressure in the extended lift and tilt cylinders .

! After having the foot brake pedal stepped down firmly, step down the accelerator pedal slowly to check and make sure the machine will not move when making such measurement.

Test Exhaust Emission Color

- If there is no air source when making air-bleeding test, please use portable smoke-tester G1. When recording the formal testing data, please use the smoke-tester G2.

△ Before making such test, be sure that the coolant temperature should be up to it normal working range.

! During installing and dismantling the testing apparatus, special care must be given not to touch the machine high-temperature parts.

- (1) Measure with portable smoke-tester G1 (Please see Fig. 05-04)

- 1) Put a piece of filtering paper on the top of the smoke-test G1.

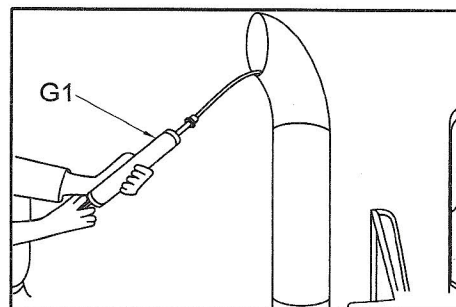


Fig. 05-04

5. Test And Adjustment



- 2) Insert one end of G1 into the engine emission tube, and at the same time have the engine accelerated suddenly. Then operate the control handle of G1 to have the engine's exhaust gas collected in the filtering paper.
- 3) Remove off the filtering paper and compare it with the standard industrial emission color sample.

(2) Measure with smoke-tester G2 (Please see Fig. 05-05, 05-06)

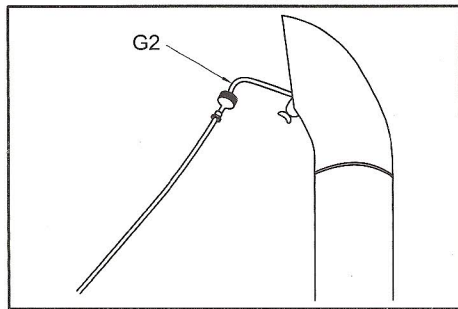


Fig. 05-05

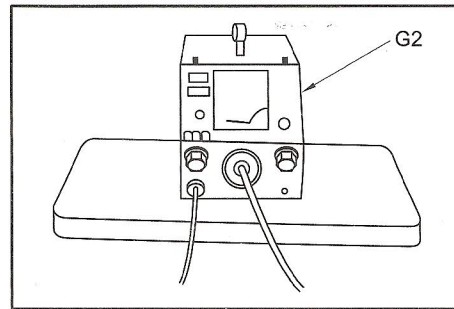


Fig. 05-06

- 1) Insert G2 into the emission tube, and clamp it tightly with a clip onto the discharging tube.
- 2) Connect the air hoses and plugs onto G2.

 Air pressure should be less than 1.5MPa (15kg/cm²).

- 3) Connect power switch to AC power socket.

 When making electrical connection, firstly check if the switch of G2 has been turned off.

- 4) Unfasten the nuts on the cover of suction pump and then insert the filtering paper.

 Make sure the filtering paper is securely installed, so as to avoid air leakage.

- 5) Switch on the power switch of G2.
- 6) Speed-up engine's rotation speed, and at the same time, step down the acceleration pedal of G2 to suck in the emission air onto the filtering paper.
- 7) Take out the filtering paper, and compare it with other unused paper (at least 10 pieces of paper). Then write down the display data.

Measure Emission Temperature

- Install a temperature sensor onto the discharging tube. Before starting to install the temperature sensor, wait a while to let the discharging tube cool down.

 Before making such measurement, warm up the coolant temperature to its normal working temperature range.

5. Test And Adjustment



- (1) Remove the plug (1) From the exhaust manifold, then install the temperature sensor (2) (Please see Fig. 05-07, 05-08).

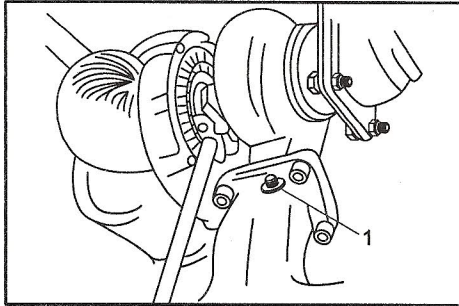


Fig. 05-07

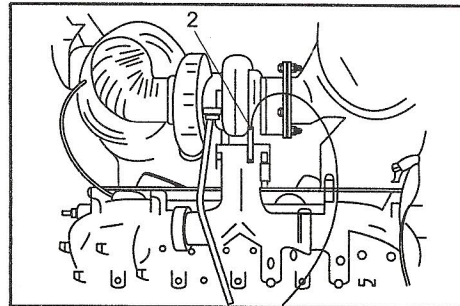


Fig. 05-08

- (2) Connect the sensor with a temperature gauge by using a wire F2 (Please see Fig. 05-09, 05-10).

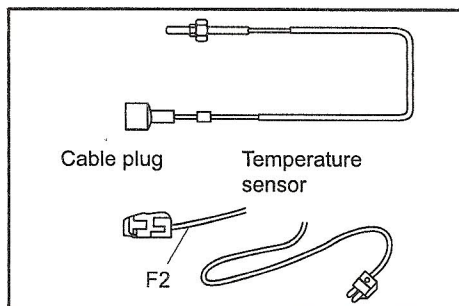


Fig. 05-09

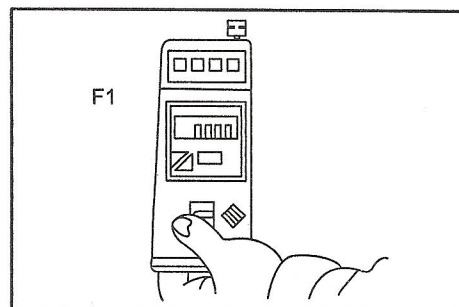


Fig. 05-10

1. Measuring Method

- (1) In case of the torque converter with only power input:

- △ If emission temperature is measured only under the case of the torque converter having only power input and lasts for a while till the sensor gets hot and could obtain stable data, then the torque converter will get too hot.
- Raise the emission temperature by means of "full speed-loss" (meaning the torque converter with only power input + overflow in hydraulic return circuit).
 - Then eliminate the hydraulic overflow situation in "a", and only maintain the torque converter having power input only.
(Emission temperature begins to lower down. If the temperature won't lower down but keeps increasing, then it means that the temperature setting in "a" is too high.)
 - When temperature begins to decrease, write down the stable temperature readings.

5. Test And Adjustment



(2) Measure the highest valve of emission temperature

Do practical operation and measure the maximum temperature valve during the machine operation.

△ Maximum value can be obtained by using the temperature gauge summit value.

Test Accelerator Pedal

△ Testing condition

- Engine water temperature: within its normal working range.

Operation force for controlling accelerator pedal.

1. Testing Method

(1) Push the force-gauge I_2 against the pedal at 150mm away from "a" point (Please see Fig.05-11, 05-12).

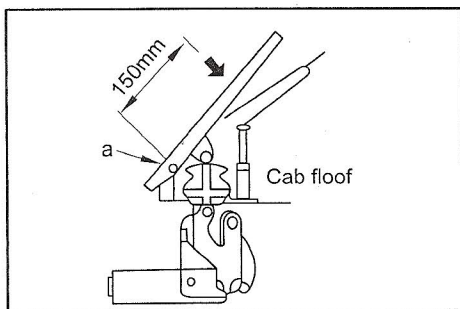


Fig. 05-11

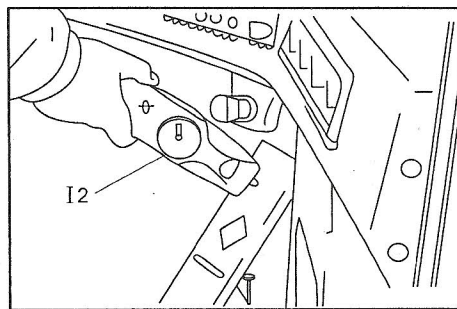


Fig. 05-12

△ Have the top of the force-gauge touch the pedal 150mm away from "a" point.

(2) Start the engine, and measure the maximum operation force on the pedal while pushing the accelerator pedal from its low idle speed through to its travel-limit end (high idle speed).

2. Test and Adjustment

(1) Shut down the engine.

(2) Remove the cable (1) at the bottom of accelerator pedal (under the operation cab floor), and check to see if the installation plate (2) and other pedal-related parts are flexible (Please see 05-13).

(3) Remount the cable (1) to the pedal bottom, and dismount another end of the steer bar at the oil-spray pump, and check to see if the cable (3) and ball-connector (4) are flexible (Please see Fig. 05-14).

5. Test And Adjustment



△ Do the above-mentioned steps to make tests and checks. If necessary, adjust or replace relative parts before attempting to re-test again the operation force on the pedal, so as to make sure it is within the standard value ranges.

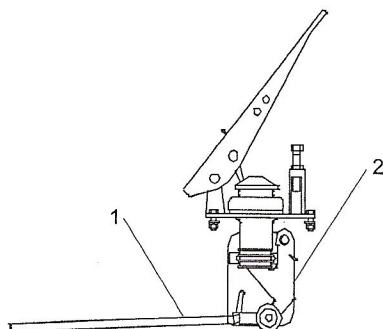


Fig. 05-13

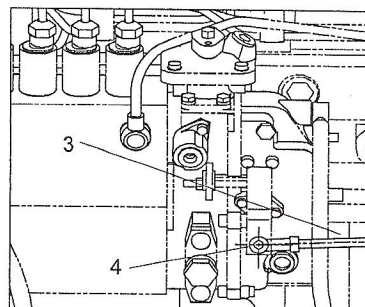


Fig. 05-14

Operation Angle of Accelerator Pedal

1. Measuring Method

- (1) Shut down the engine.
- (2) Touch the accelerator pedal with an angle-gauge (1), and measure the movement angle α ($\alpha = \alpha_1 - \alpha_2$) of the pedal from the positions (α_1) at its low idle speed to (α_2) at its high idle speed (Please see Fig. 05-15 and 05-16).

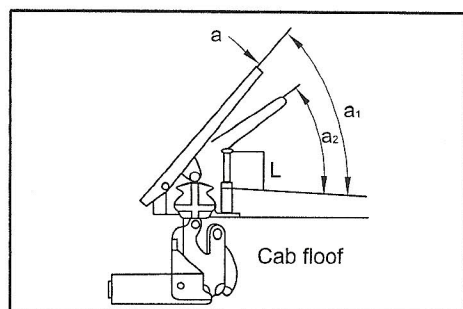


Fig. 05-15

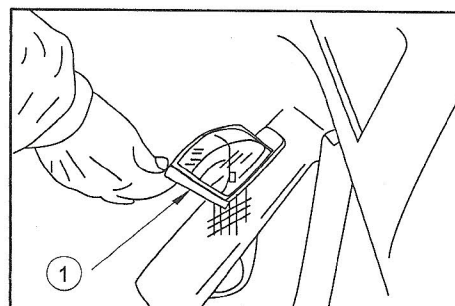


Fig. 05-16

2. Adjustment Method

- (1) Unfasten the mounting nuts and adjustment bolts at the bottom of the pedal (on the cab floor) to have the height (L) of pedal limit-bar be at its normal working range (Please see Fig. 05-15).
- (2) Unfasten the bolts and adjust properly the length of cable (3), so that the adjustment lever of the oil-spray pump could touch with the pedal limit-bar when the pedal is stepped down to its high idle-speed position.

△ At the same time, also check if the adjustment lever of the oil-spray pump could touch the pedal limit-bar when the pedal restore to its low idle-speed position.

5. Test And Adjustment



△ The travel limit of the adjustment lever could be adjusted via the ball connector (4) (Please see Fig. 05-14).



Connecting nuts on cable: $15 \pm 1\text{Nm}$.

△ After finishing the above-mentioned adjustment, re-measure each part of the pedal to make sure it is conforming with the standard range.

Test Oil Pressure in Gearbox and Torque Converter

△ Testing condition

- Engine water temperature: within the normal working range.
- Oil temperature in Torque Converter: 60-80°C.



Get the parking brake engaged, and block the machine tires with wedges.

1. Preliminary preparation work

△ The following preparation needs to be done when your test the oil pressure.

- Remove the cover (1) at one side of the rear frame (See Fig. 05-17).
- Disconnect the power output from the gearbox.
- Take the plug off the measuring port of the gearbox.
- Install pressure-gauge onto the measuring port of the gearbox, and get it connected with the control panel inside the cab. Afterwards, start the engine and begins to measure the oil pressure (See Fig. 05-18).

△ Check to see if there is any oil leakage from all the mounting connectors.

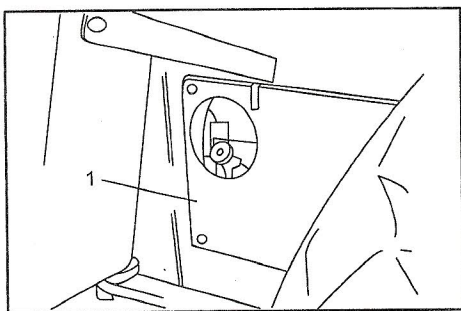


Fig. 05-17

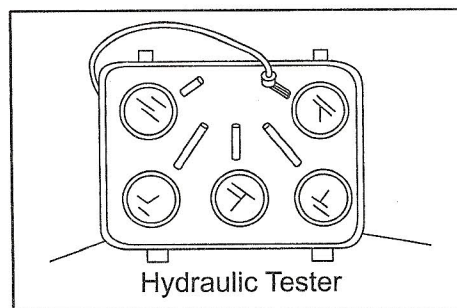


Fig. 05-18

2. Measuring Method (See Fig. 05-19)

(1) Oil pressure of the gearbox system

5. Test And Adjustment



- 1) Measuring port (E, M10 × 1).
 - 2) Start up the engine and let it run at the low idle speed, then measure the oil pressure under the rated rpm.
- (2) Oil pressure at the torque converter output port
- 1) Measuring port (F, M14 × 1.5).
 - 2) Start up the engine and let it run at the low idle speed, then measure the oil pressure under the rated rpm.

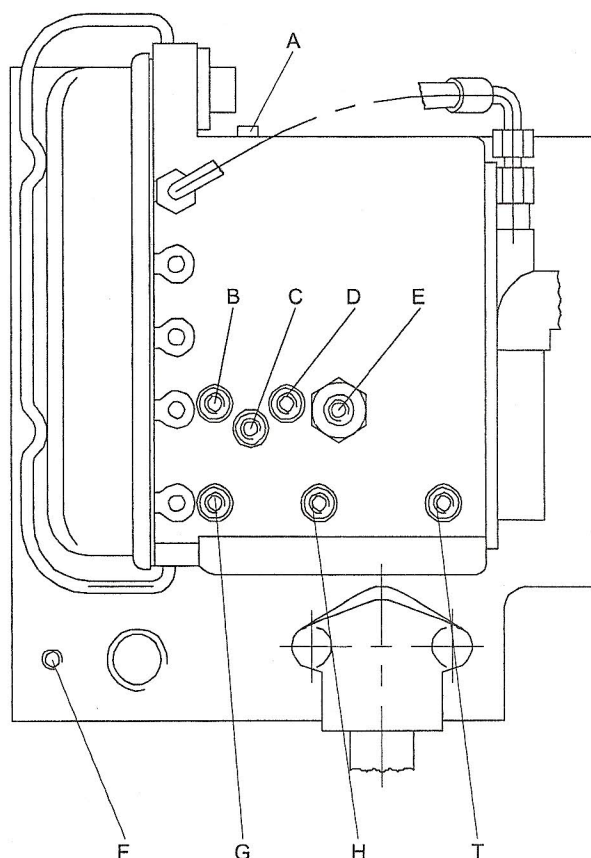


Fig. 05-19

- (3) Oil pressure at the torque converter input port
- 1) Measuring port (A, M10 × 1).
 - 2) Start up the engine and let it run at the low idle speed, then measure the oil pressure under the rated rpm.
- (4) Oil pressure of the clutch
- 1) Measuring ports (B、C、D、G、H、T, M10 × 1).
 - 2) Start up the engine.
 - 3) Release the parking brake.
 - 4) Place the gear selector at the neutral position, then measure the oil pressure while you operating the gear selector to different gear-ranges.

Measure Clearance between Rims and Tires

△ Measuring condition

- Tire inflation pressure: rated pressure (Please see Chapter 03).

1. Measuring Method

(1) Measure the dimensions of "a" and "b" with a ruler (See Fig. 05-20).

(2) Clearance of tire ring:

Measure the dimension for "c" (See Fig. 05-21).

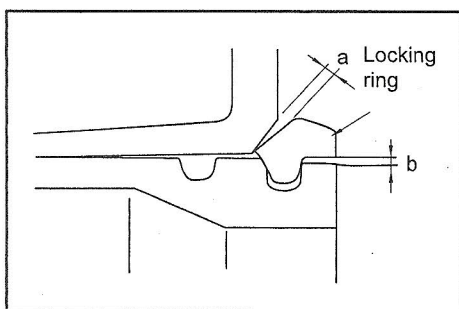


Fig. 05-20

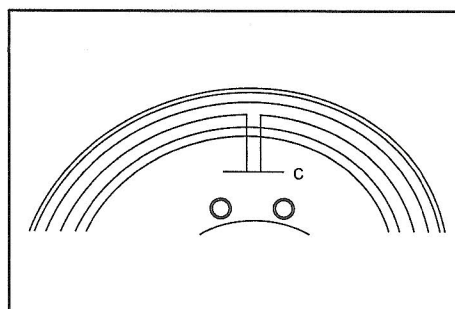


Fig. 05-21

Test and Adjust Steering-Wheel

1. Test Clearance of Steering-Wheel

△ Testing condition

- Engine speed: engine shut down.
- Machine status: front and rear machine frames in straight-ahead position.

2. Testing Method

- (1) Turn gently the steering wheel to both left and right for 2-3 times, and check if the steering mechanism is in its center position, and then make marks on the instruments panel (Please see Fig. 05-22).
- (2) Turn the steering-wheel again to right, and make a mark at the position where you feel it is a little bit hard to turn the steering-wheel.
- (3) Turn the steering-wheel to left (in the opposite process to Step 2), and also make a mark at the position where you start to feel it is a little bit hard to turn the steering wheel. Afterwards, measure the distance between the two marks that you just made (Please see Fig. 05-23).

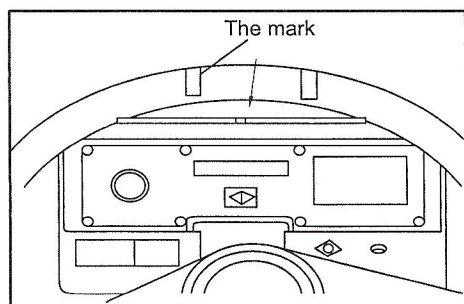


Fig. 05-22

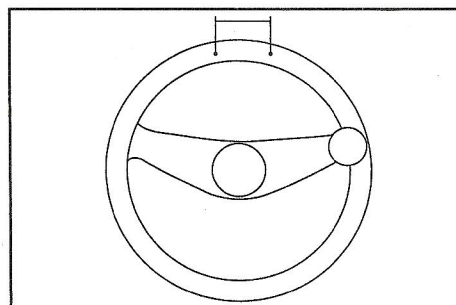


Fig. 05-23

Measure Operation Force for Steering-Wheel

△ Measuring condition

- Terrain: be flat, even and dry paved road.
- Engine water temperature: within its normal working condition.
- Hydraulic oil temperature: 45-55°C.
- Tire inflation pressure: rated pressure (See Chapter 03).
- Engine speed: at low idle speed (without load in machine bucket).

1. Measuring Method

- (1) Install the force-gauge I_2 onto the steering wheel ball-shape handle (See Fig. 05-24).
- (2) Start up the engine.

△ After the engine being started, raise the bucket about 400mm high.

- (3) Pull out the force-gauge along tangential direction, and measure the force when the steering-wheel slides smoothly.

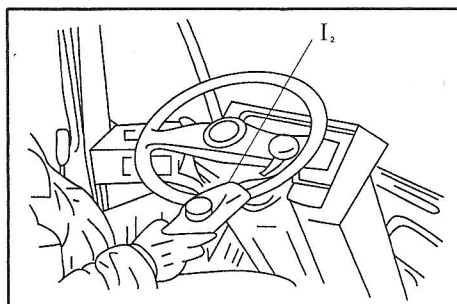


Fig. 05-24

△ Avoid measuring this force when the steering wheel just begins to turn.

Measure Operation Time for Steering-Wheel

△ Measuring condition

- Terrain: be flat, even and dry paved road.
- Engine water temperature: within its normal working condition.
- Hydraulic oil temperature: 45-55℃.
- Tire inflation pressure: rated pressure (See Chapter 03).
- Engine speed: at low and high idle speed (without load in machine bucket).

1. Measuring Method

- (1) Start up the engine.

△ After starting the engine, raise the bucket to about 400mm high.

- (2) Turn the steering-wheel to both right and left to its maximum travel limit (See Fig. 05-25).

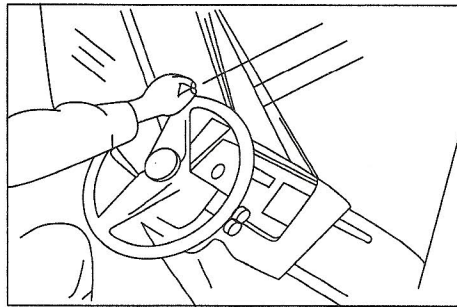


Fig. 05-25

- (3) Measure the time duration that is needed to turn the steering wheel to its maximum travel limit to both left and right.

△ Don't operate the steering wheel very quickly with much force.

△ Above-mentioned measurement should be done, to both left and right, under two cases: with engine at its low idle speed and high idle speed.

Test and Adjust Steering Angle

△ Testing condition

- Hydraulic oil temperature: 45-55℃.
- Engine speed: 1200rpm.
- Terrain: be flat, even and dry paved road.
- Tire inflation pressure: rated pressure (Please see Chapter 03).

1. Testing Method

- (1) Start up the engine, and operate the steering system to have the machine front and rear frame be in alignment.
 - (2) check the fastening tension of the position-limit bolt (1) and locking nut (2) (Please see Fig. 05-26).
 - (3) Start up the engine, and measure the clearance between the position-limit bolts of both front and rear machine frames while turning the steering wheel to both left and right to its most limit position.
- △ When measuring such clearance, check the end-surface of steering valve (3) to see if it is in good touch with the position-limit bolts.

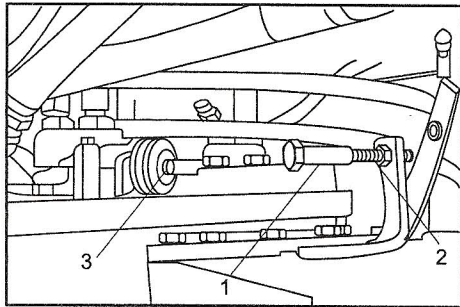


Fig. 05-26

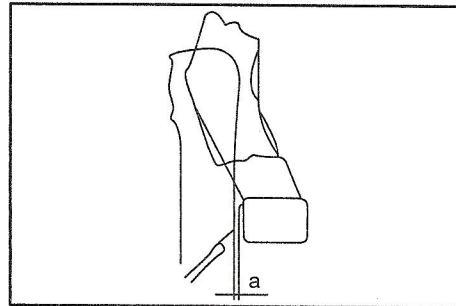


Fig. 05-27

2. Adjustment method

- (1) Adjust the bolts.
 - 1) Screw in the position-limit bolt (1) to get it with minimum length.
 - 2) Let the engine run at low idle speed, and turn the steering-wheel slowly in such a way that the end-surface of the bolt (1) moves towards the steering valve (3) (Please see Fig. 05-26).
 - 3) Turn the bolt till it could touch the end-surface of the steering valve (3).
 - 4) Get the machine facing forward and the machine front and rear frames be in alignment. And stop the engine running.
 - 5) Fix the bolt (1), with a locking nut (2), to a support bracket.
 - 6) Do steps from 1)-5) on both left and right sides till standard steering angle is available after such adjustment.
- △ During adjusting the steering control, you should start up the engine, and at the same time measure the clearance (a) between the front and rear frames when you turn the steering wheel to its maximum limit positions on both left and right sides, so as to avoid any conflict between any machine parts (See Fig. 05-27).
- △ When measuring such clearance, also check if the end-surface of steering valve (3) could touch the bolt (1).

Measure Operation Force And Travel Limit of Braking Pedal

△ Measuring condition

- Engine water temperature: within its normal working temperature.
- Engine rotation speed: low idle speed.

1. Method for Measuring Operation Force for Brake Pedal

(1) Fix the force-gauge (1) onto the operator's foot (See Fig. 05-28).

△ Get the centers of both the force-gauge and the brake pedal be in alignment.

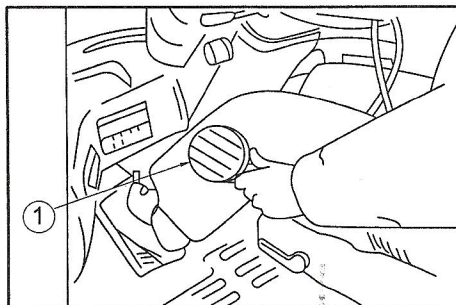


Fig. 05-28

(2) Start up the engine and let it run at low idle speed. And measure the operation force when you stepping down the pedal.

2. Method for Measuring Brake Pedal Travel Limit

(1) Fix the force-gauge (1) onto the operator's foot.

△ Get the centers of both the force-gauge and the brake pedal be in alignment.

(2) Start the engine, and measure the angle α_1 when the engine is running at low idle speed; and measure the angle α_2 when you step down the pedal with the force of 30kg.

△ When making such measurement, install the angle-rule (2) onto the brake pedal (See Fig. 05-30).

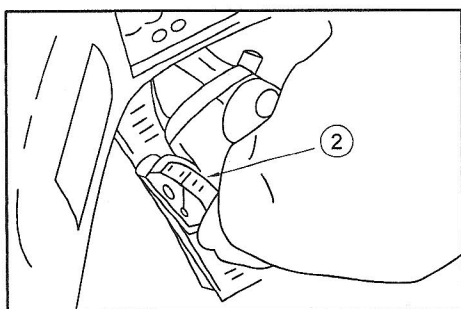


Fig. 05-29

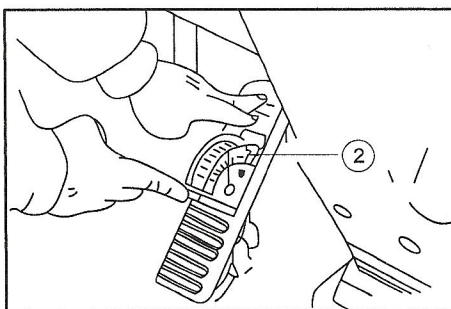


Fig. 05-30

3. Brake Pedal Clearance

(1) Start up the engine.

(2) Push slightly, with hands, the brake pedal. And measure the angle α_3 when you just feel it gets heavy to push the pedal (See Fig. 05-31).

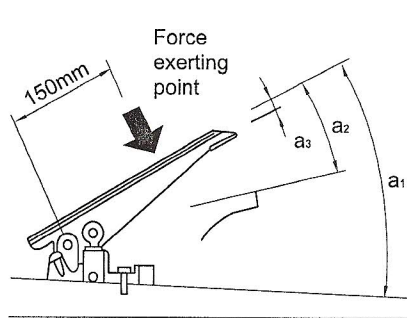


Fig. 05-31

Testing Brake Performance

△ Measuring condition

- Terrain: be flat, even and dry paved road.
- Machine driving speed: 32km/h when brake being engaged.
- Braking time: 0.1 second.
- Tires inflation pressure: at rated pressure (Please see Chapter 03 for details).

1. Testing Method

- (1) Start up the engine and drive the machine.
- (2) Select the highest speed gear, and drive the machine.
- (3) When the machine driving speed is up to 32km/h, step down, with required force, the brake pedal on the
 △ Before making such test, firstly find a machine driving route and a place where you can stop the machine, then engage the braking system of the machine and stop it at this place.
- (4) Measure the distance between the place where the machine stops and one where you just step down the brake pedal (See Fig. 05-32).
- △ Repeat the above process for 3 times, and take the average measurement value.

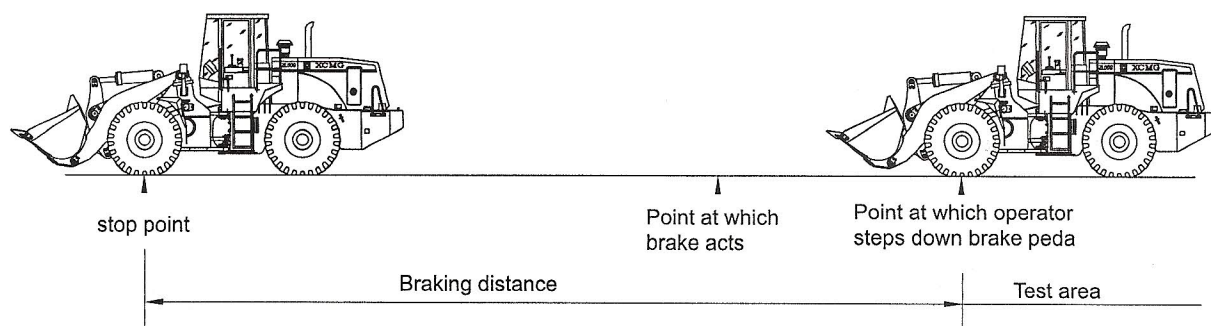


Fig. 05-32

Test Parking Brake Performance

△ Testing condition

- Tires inflation pressure: At rated pressure (See Chapter 03 for details).

5. Test And Adjustment



- Terrain: be flat and dry paved road, with slope of 1/5 (11° 20').
- Machine status: under normal working condition.

△ Keep the parking brake switch at "OFF" position.

1. Testing method

- (1) Start up the engine, and drive the machine in straight line, and then have it climb a slope of 1/5, with its bucket unloaded (See Fig. 05-33).

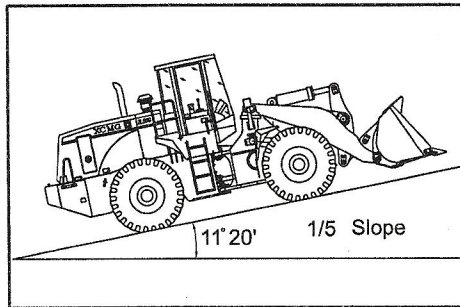


Fig. 05-33

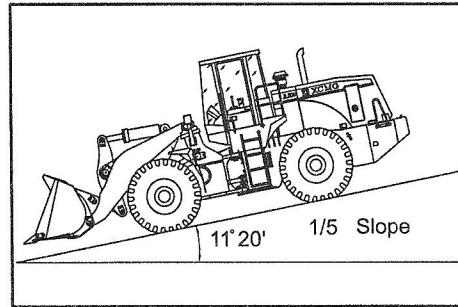


Fig. 05-34

- (2) Step down the brake pedal to stop the machine, and place the gear-selector joystick at neutral position, afterwards, shut off the engine.
 - (3) Get the parking brake switch engaged, then release gradually the foot brake pedal and check if the machine still maintains at its original position.
- △ Make such testing in two times: one is for the case of up-slope, and one is for the case of down-slope (See Fig. 05-34).

Test Multi-Way Valve Overflow Pressure

△ Testing condition

- Engine water temperature: within its normal working temperature range.
- Hydraulic oil temperature: 45-55°C.
- Engine speed: high idle speed.

⚠ Get the parking brake engaged, and block the front and rear tires with wedges.

1. Testing method

Raise the boom(1), and then put a support bracket (2) (to be prepared by end-users themselves) under the boom to support it. Afterwards remove off the cover plate (3) in the front frame (See Fig. 05-35, 05-36).

⚠ Unfasten the oil-filling cap to release off the pressure inside the hydraulic tank, then repeatedly operate the bucket-control lever, moving it for at least 40 times between dumping-control position to its neutral position, so as to completely release off all the remaining pressure in the hydraulic circuits and hydraulic units.

5. Test And Adjustment



- △ After finishing operation on the bucket-control lever, check if there is any leakage from the bucket.
- △ Before operating the bucket-control lever, make sure the engine must be shut off.

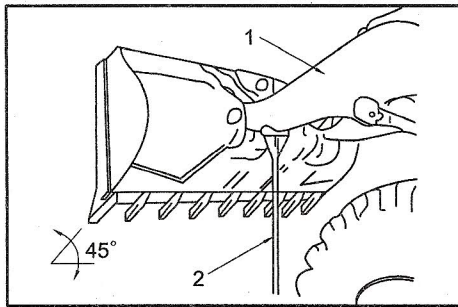


Fig. 05-35

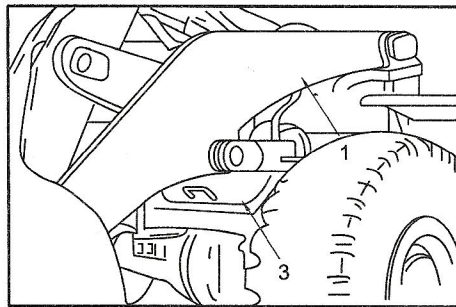


Fig. 05-36

- (2) Remove off the pressure-measuring plug which is located at the bucket cylinder, and then install a hydraulic testing apparatus onto this location.

- △ Check to see if there is any oil leakage.
- △ Please use a hose with enough length to connect it to the operation cab.

- (3) Start up the engine, and raise the boom to about 400mm high, and then operate the bucket-control lever, and measure the pressure while the bucket tilting backwards.

- △ Don't apply sudden pressure to the pressure-gauge.

- ⚠ When dismantling the pressure-gauge, repeat above process again to release all the pressure in the hydraulic return circuit.

Test Hydraulic Pressure & Oil Leakage

- △ Testing condition

- Engine water temperature: within its normal working temperature range.
- Hydraulic oil temperature: 45-55°C.
- Wait 5 minutes after the machine engine stops. Testing time lasts for 15 minutes.
- Working boom: be in horizontal status.
- Bucket: be in horizontal status.
- Loading mode: none loading.

- ⚠ Get the control-levers for all working mechanism be locked (Turn the ball valve of leading oil to close gear).

- ⚠ Never walk under the working mechanism of the machine.

1. Testing method

- (1) Keep the boom and the bucket be in horizontal status, then shut off the engine (See Fig. 05-37).
- (2) Wait for 5 minutes and then start to make measurement.

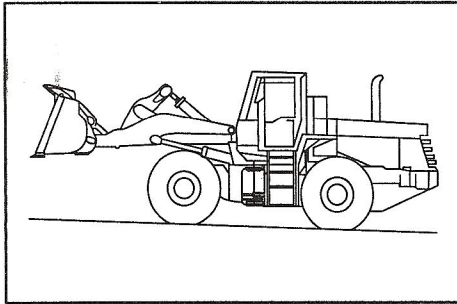


Fig. 05-37

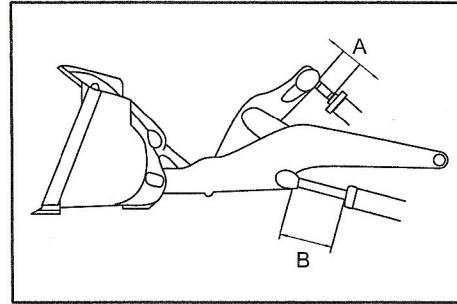


Fig. 05-38

- (3) Wait for 15 minutes, then measure the retraction size (A) of the bucket cylinder piston as well as the retraction size (B) of the boom cylinder piston.

Test Working Speed of Working Mechanism

△ Testing condition

- Engine water temperature: within its normal working temperature range.
- Hydraulic oil temperature: 45-55℃.
- Engine speed: high idle speed.
- Steering-wheel status: be at neutral position.

1. Testing method

(1) Time for raising boom

Lower the bucket down to its lowest position and then tilt it backwards to its limit. Then raise it up, and at the same time measure how long it needs to lift the boom to its highest position (See Fig. 05-39).

(2) Time for lowering boom

Keep the bucket in horizontal status, then lower it down from its highest position to its lowest position, during which, measure the time it needs to finish this process (See Fig. 05-40).

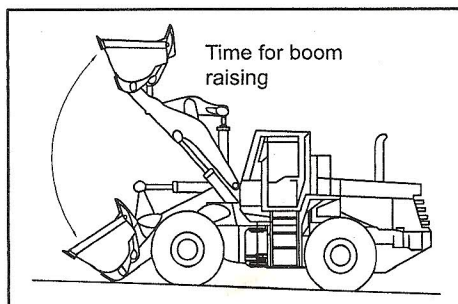


Fig. 05-39

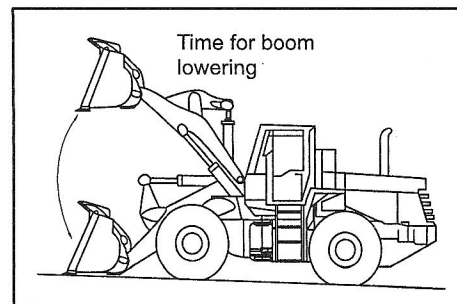


Fig. 05-40

5. Test And Adjustment



(3) Time for discharging material from bucket

Raise the boom to its highest position, and measure the time it needs to finish the operation process from fully tilting backwards to material-discharging (i.e: the bucket be fully tilted forwards) (See Fig. 05-41).

(4) Time for tilting bucket

- 1) Raise the boom to its highest position, and measure how long it needs to move the boom from being horizontal position to fully being tilted backwards.
- 2) Get the bucket be parallel to the ground, and measure how long it needs to move the bucket from being horizontal position to fully being tilted backwards. (See Fig. 05-42).

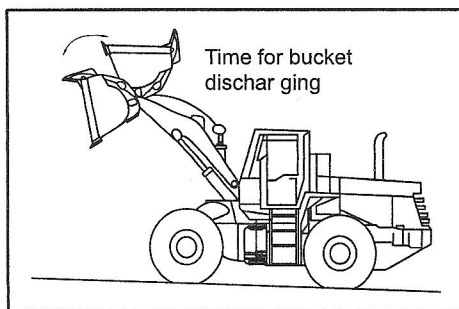


Fig. 05-41

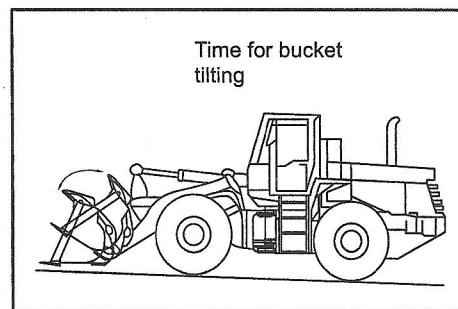


Fig. 05-42

Test And Adjustment for Bucket Self-Leveling Approximate Switch

1. Testing method

- (1) Shut off the engine, and check the clearance between the approximate switch

1) and the steel plate (2) (See Fig. 05-43).

- Standard clearance (a): 3-7mm.

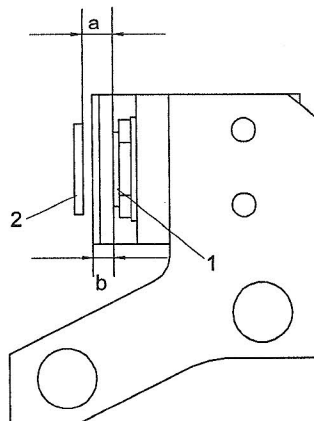


Fig. 05-43

- (2) Start up the engine and let it run at its full speed, and at the same time check the approximate switch.

2. Adjustment method

- (1) Lower the bucket down ground, and operate the bucket-control lever to have it raise to desired position with proper break-out angle, and then maintain the control lever at "HOLD" position, afterwards, shut off the engine.
- (2) Adjust the mounting nut (5) of the approximate switch (1) in such a way that the top end (4) of the support bracket keeps a certain standard clearance (b) with the switch sensor (1). (See Fig. 05-43 and Fig. 05-44).

- Standard clearance (b): 1.0 - 1.5mm.

- (3) Unfasten the mounting bolt (3) and adjust the support bracket (4), and then adjust the clearance (a) between the approximate switch (1) and steel plate (2). Make sure the clearance (a) should be proper and standard. Afterwards, fix them all into original position.

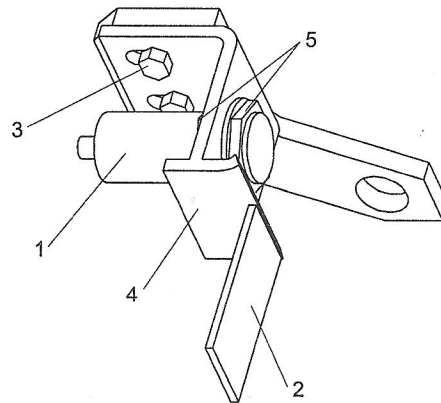


Fig. 05-44

- Standard clearance (a): 3-7mm.

△ Check if there is any conflict between the switch sensor and the steel plate.

△ After fixing all of them on their original position, make sure the center-line of the switch sensor and the steel plate should be in alignment,

- (4) After finishing such adjustment, operate the control-lever again to check if the approximate switch would work properly after being adjusted.

Test And Adjustment for Driving Axle Gears Engagement

1. Gear Engagement Clearance

Testing method

Put a centigrade-meter on the gear surface (on the bigger end)of the driven gears, and turn the driven gears, then you can measure the gear engagement clearance. (See Fig. 05-45).

- Standard clearance: 0.20-0.40mm.

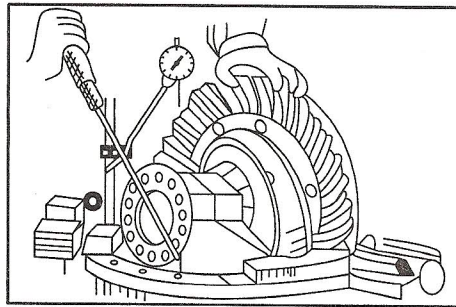


Fig. 05-45

Adjustment method

Turn the adjustment nut which is functioned as adjusting the axial tension of the roller-bearing in the axle differential (Please see Fig. 04-37 or 04-38) to change the location of the driven screw-taper gears (if necessary, slightly move the driving gear assembly to make such adjustment). If the checked clearance is more than standard value (0.20-0.40mm), then let the driven gears and the driving gears get near, and vice-versa.

△ In order to maintain the tension of the roller-bearing unchanged, apply the same turns on the adjusting nut when screwing it in on one end and screwing it out on another end.

2. Engagement Area

Testing method

Make red marks on the driven gears (normally three gears), and then turn the driven gears assembly by hand to check the engagement traces.

- Standard engagement status: Engagement area should not be less than 50% (both in terms of the gear length and the gear height), with engagement traces near to the smaller end of gears.

Adjustment method

- (1) In case the engagement trace is like what is shown as (a), then move the driven gears towards the driving gears. If finding the clearance is too little, then move the driving gears outwards. Moving direction for gears is shown in (1) (Please see in Fig. 05-46).

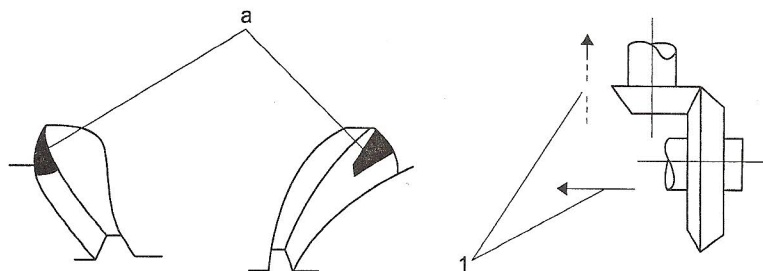


Fig. 05-46

5. Test And Adjustment



- (2) In case the engagement trace is like what is shown as (b), then move the driven gears away the driving gears. If finding the clearance is too much, then move the driving gears inner-wards. The direction for moving gears is shown in (2) (Please see Fig. 05-47).

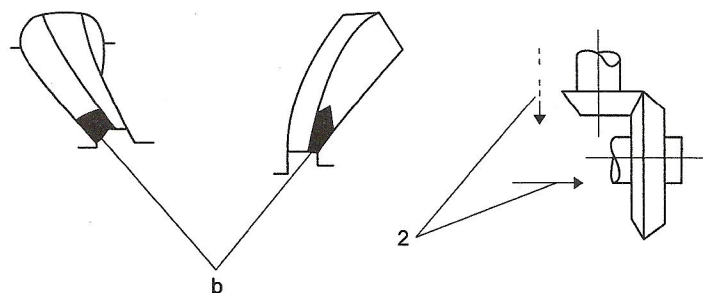


Fig. 05-47

- (3) In case the engagement trace is like what is shown as (c), then move the driving gears towards the driven gears. If finding the clearance is too little, then move the driven gears out-wards. The direction for moving gears is shown in (3) (See Fig. 05-48).

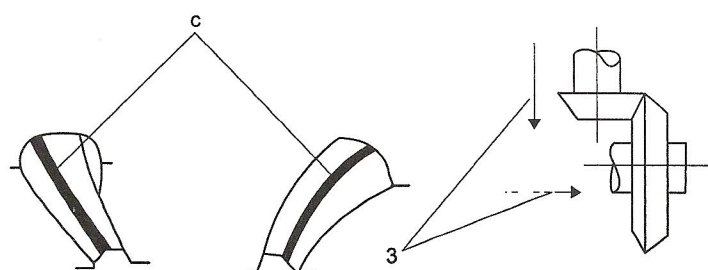


Fig. 05-48

- (4) In case the engagement trace is like what is shown as (d), then move the driving gears away the driven gears. If finding the clearance is too much, then move the driven gears inner-wards. The direction for moving gears is shown in (4) (See Fig. 05-49).

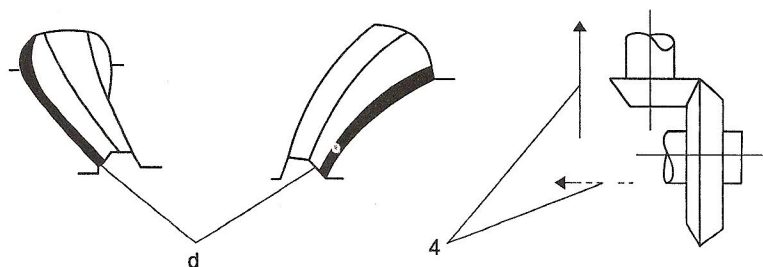


Fig. 05-49

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



Preface

As the wheel loaders are frequently used under very complicated and tough working condition, with very tough environment. So after a wheel loader being used for a certain period of time of driving and working, the machine status will be gradually deteriorated as time goes on, which will subsequently cause the machine power decreased, economic value lowered, working performance and reliability down-graded. When such phenomena gets worse, the machine will definitely have breakdown. This is the normal procedure for a machine. However, if the machine operator or service people could make in-time diagnosis to the machine trouble, find the trouble causes and give earlier maintenance and service to the machine according to corresponding troubles phenomena, then it will helpful to eliminate the machine troubles, prolong the machine service life, reduce overhaul repair frequency and decrease repair cost, all of which will definitely improve the machine economy.

Therefore, this chapter gives the detailed description on the wheel loader troubles phenomena, troubles causes as well as the general process and methods for finding out troubles causes and troubles shooting, which will give very helpful reference to the machine operator or service people when they do service work on the machine.

6.1 Troubles Phenomena And Troubles Causes

6.1.1 Troubles Phenomena

Wheel Loaders Driving Performance Getting Poor

The down-grading driving performance of a wheel loader is mainly shown on the machine traction force decreasing and/or the difficulty to raise machine bucket, which is always contributed to the gear pump getting worn out, the multi-valve distributor with too much clearance, or the hydraulic sealing rings getting worn out or damaged in the hydraulic system of the wheel loader. And if the torque converter or gear pump inside the gear box gets worn out, then it will cause the machine could not move or move very hard. Further more, if the engine piston and piston ring get worn, then it will cause the engine could not suction in enough air, which will decrease the engine output power. Therefore, when the operator or service people finds that the driving capability of the machine gets poor, then it means that the machine system has something wrong, so you must give enough care to such trouble phenomena.

Performance Reliability And Safety Performance Getting Poor

The braking performance of a wheel loader depends upon how properly the braking valve, energy reservoir and braking mechanism function. If all these braking apparatuses get wore out, then the machine braking performance also gets poor. And the engine itself will also encounter the problems, such as: be very hard to be started or totally not be started at all, due to the engine components also getting worn out. As for hydraulic system, possibly due to the hydraulic oil being polluted or the oil leakage in the steering cylinder, so you will find that the machine could not make steering effectively or there is no steering at all even you turn the steering wheel. All of these problems on the machine will lead machine breakdown frequently and

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



also raise the issues, such as: machine performance deteriorating, too times of repairs, production efficiency lowering and safety function getting poor, for which the machine operator and service people should keep a close alert.

Not Economic

The worn-out oil supply system of the machine will severely affect the engine fuel injection performance, which, being as a result, will cause the diesel oil could not be well mixed with air, leading the diesel oil could not completely burn, hence, it means the machine will consume more fuel and the engine power gets lowering. And in addition, if the clearance between the cylinders and pistons gets too much, then it will have the diesel oil penetrate into combustion chamber, which will cause more fuel is needed. And further more,, due to oil leakage, the consumption for lubricating oil, transmission oil or hydraulic oil will also be increased. Each of the above problems will increase more cost input on the machine.

Abnormal Color of Exhaust Emission

Normally speaking, the exhaustion emission is of gray color. But if the engine fuel could not completely burn due to insufficient air take-in and poor fuel vaporization, then the emission system will spray out black smoke. And if the clearance between the cylinders and pistons gets too much , which will cause too much lubricating oil is sucked into the combustion chamber of the engine, then the engine will send off blue smoke. Also, if circulating water enters into combustion chamber due to the pneumatic sleeves or pneumatic washers get damaged, then quite much steam will be sent off through the emission system, so the emission smoke will be in white. While, if the fuel consists a certain amount of water, the emission smoke will also in white. So by observing the color of the emission smoke, you can tell the working performance of the engine, which is also an important method to judge what's wrong with the machine.

Machine Parts Getting Too Hot

The normally-seen machine parts that possibly get overheated are engine, gearbox, torque converter, hydraulic pump, driving axle differential, etc. The reasons which cause those parts to be overheated are improper running, improper maintenance or poor radiation, etc, each of which is also the early evidence showing the specific machine part has something wrong or get damaged. Therefore, machine operator or service people must give special attention to such problem phenomena.

Abnormal Noise And Vibration

After the machine being used for a certain period of time, due to the machine parts getting worn or out-shape, you may heard some abnormal sound produced from the machine during the machine driving, which can be regarded as a kind of evidence to tell the machine has got something wrong.



6.1.2 Trouble Causes

As the wheel loaders are normally used or driven under the complicated working condition with tough terrain or surrounding environment, so there may be various reasons for the machine problems. Generally speaking, we classify 6 major reasons for the machine problems.

Defects on Machine Design

The design of a wheel loader is much complicate. If a designer of the wheel loader lacks a well-understanding to the machine application, he will not give sufficient consideration to the machine application requirement and working requirement during his designing, whose designing on the machine would not ensure all the machine components to work harmoniously, which, being as a result, will rise some problems during the process of using the wheel loader.

Defects on Machine Manufacturing

The manufacturing process of a wheel loader is also a critical step which ensures the machine quality and performance reliability. During such process, if a machine part is not made according to its designed dimensions or the engineering process for manufacturing the part is not reasonable, then the geometric dimension of the part and its mechanical performance could not be guaranteed, which will definitely cause pre-mature breakdowns of the machine.

And in the process of machine assembly, due to improper adjustment or none-adjustment at all during machine assembly, then you could not ensure all the working parts to be in good clearance with each other, so pre-mature troubles will be arisen due to the improper relative location of components on the machine, which, of course, will affect machine technical performance. In addition, the inspection methods and working apparatus that are adopted during the machine assembly are also very important for ensuring machine quality. You should use the proper assembly and inspection tools during machine assembly.

Foreign Condition Impact on Machine

The foreign condition what could affect a wheel loader operation performance is mainly referring to climate status (extremely hot or cold weather, or high-plateau areas), working area or the specific application requirement. If ambient temperature is very hot, it will result the bad radiation for the engine, which, being as the result, will cause the machine being over-heated, lubricating oil density getting thin and greasing effect getting poor; if the ambient temperature is too cold, it will reduce the engine power efficiency, which is not economic to a machine, while it also cause the lubricating oil getting thin, reduce greasing reliability and speed-up parts wearing. In addition, low temperature will also make it hard to start up the machine engine.

The working-site and specific application also play important role in affecting wheel loader service life. In the un-even and un-flat working area, the machine is always keeping bumping, shocking and vibrating due

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



to such bad terrain condition, so it will speed up the machine parts wearing or getting amaged. While improper application for a wheel loader usually will damage the machine working tools. In addition, the stone, aggregate or glass in the jobsite will crack the machine tires, affecting the tires service life. Also, if there is too must flying dust in the jobsite, it will speed up the wearing to the machine engine.

Improper Use of Oil Liquid

In order to maintain a wheel loader working properly, it is a must to use the correct types of lubricating oil, grease, transmission oil and hydraulic oil during working with a wheel loader. Otherwise, it will speed up wearing to the machine parts, up-grade machine performance reliability and deteriorate machine technical status.

The use of diesel oil is very critical to the machine engine. Poor-quality diesel oil will take more time to completely combust and will speed up wearing to the engine parts.

The quality of lubricating oil plays direct impact on the lubrication to the machine. Density of lubricating oil is an important specification. In case the oil density is too thick, then it will be of poor flowing, while the oil density is too thin, it will not function well to lubricate the conflicting machine parts, which will speed up wearing to machine parts.

Hydraulic system also requires high-quality hydraulic oil. The use of improper hydraulic oil will result the poor performance to the machine hydraulic performance.

Wrong Operation

Any wrong operation to the machine, due to unfamiliarity to the machine operation rules, being unskillful to the machine operation process and careless operation by accidents will result severe damages to the machine parts or produce risk of hazards.

Over-loading burden on a wheel loader is also an element that affects the machine parts damages or even causes possible hazards. In this manual, rated loading capacity of the wheel loader is clearly stated. During working with the wheel loader, if the machine is kept working with over-load burden long time, it will cause the machine temperature to be rising very fast and very high, which will definitely bring pre-mature damage or breakdown to the machine.

Improper Maintenance

As a wheel loader normally works in a very tough working environment, so it is very important to give timely and periodical maintenance to the machine. Quite a lot of machine problems are just caused due to the improper maintenance to the machine. And any repairing and adjustment not binding to technical requirement will also lead the machine be troubled with machine. In addition, the use of none-genuine spare parts can also cause the machine problem.



6.2 Trouble Diagnosis And Trouble-Shooting

6.2.1 Instruction to Trouble-Shooting

- Park the machine onto a flat area, and check the safety-locking device. Make sure the blocking wedge and parking brake function well.
- In case there are two people or more than two people working at the same time on the machine, please use the signs or gestures understandable to everybody. Any un-relative people is not allowed to approach near the machine.
- Only after the machine engine temperature cools down can you carry out checking and maintenance on the machine, as the water inside the engine water tank is still in hot temperature, which possibly will burn the service people while he attempts to open the water tank cover.
- Special care must be given for not touching any hot machine parts or neither being hung by any turning parts.
- When handling with the electrical connection or disconnection, be sure to disassemble the Negative (-) pole of the terminals.
- When dismantling plugs or caps from pressurized oil, water or air tubes, firstly be sure to release off the inner pressure from those tubes. And when installing a testing apparatuses, make sure the testing apparatuses are correctly connected and installed.

6.2.2 General Process for Trouble-Shooting

When giving trouble-shootings to the machine, it is critically important to well understand the machine structure and its function. However, effective short-cut measures are also helpful to make diagnosis to the trouble causes and think of possible solution to the troubles.

- (1) When making trouble-shooting, don't be hurry to disassemble the machine parts. If you try to disassemble the machine parts once a trouble is found, then it will be followed with:
 - a. Disassembling other components which is not related to the part that is found with problem.
 - b. No cause can be found at all.

At the same time, it will bring additional cost in terms of workforce, spare parts, lubrication and grease. In addition, it also maybe create a risk of losing trust from customers and machine operators.

Therefore, during making trouble-shooting, firstly investigate the trouble causes in a certain steps, and then repair the machine.

(2) Key Points to be Inquired

- a. Besides the reported problem, is there any other problem that has taken place?
- b. Before the reported problem happened, is there any abnormal phenomena on the machine?
- c. Did the reported problem happen suddenly? Before it happen, is there any other cases of problem?
- d. Under what condition that the problem happened?

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



- e. What kinds of repair have been made on the machine before the reported problem happened?
- f. Were there such problems previously?

(3) Checking to be Made before Trouble-Shooting

- a. Check oil level.
- b. Check if there is any leakage from the pipe-lines or hydraulic system.
- c. Check the operation travel of each control joysticks.
- d. Check the operation travel of each control valves.
- e. Check other maintenance items visibly, particularly check the mandatory maintenance points.

(4) Trouble Diagnosis

Determine how serious problem it is, and judge what is the true reason of the problem: Is it due to the machine failure itself, or is it because the wrong or improper operation to the machine?

△ When re-showing the machine problem by operating the machine again, bear it in mind that attention should be given not to deteriorate the machine problem when you driving the machine again for making study or test to the problem.

(5) Trouble-Shooting

Figure out the problem scope and reason by making study or test to the machine problem (according to the steps of 2-4 above mentioned), then confirm where the problem source is located.

△ Basic process of trouble-shooting goes like this:

- a. Starting from the most simple method;
- b. Following the most possible judgment;
- c. Looking up other documentation or manuals which are related to the problem.

(6) Test if the Problem is Eliminated

Even the problem is remedied, however, if the source of such problems is not eliminated, then similar problem will still happen, so the service people must investigate and figure out the original source of the problem and eliminate it.

6.2.3 Process of Trouble-Shooting

Service people can take the following steps to make trouble-shooting:

Step 1: Check And Determine Problem

(1) When getting the service inquiries, please ask the following questions:

- a. Customer name
- b. Machine model and serial number;
- c. Detailed information about jobsite;

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



(2) Learn the general situation of the problem case by asking the following questions:

- a. Basic situation of the problem case.
- b. What kind of work it is that the machine is used for when the problem happens.
- c. Machine working environment.
- d. Repairing and service history record of the machine.

Step 2: Determine the Basic Location of the Problem

(1) Please refer to the section "Trouble-Shooting", and find out the possible location where the problem lies.

Step 3: Prepare Service Tools

- (1) Please refer to the section of "Dismounting And Assembly", and get the service tools available.
- (2) Please look up the Parts List Manual, and get the replacement parts available.

Step 4: Go to Jobsite

Step 5: Ask the Machine Operator Personally And Figure Out the Problem Details.

- a. Before the problem happens, what kind of abnormal phenomena that the machine has?
- b. Does such problem happen suddenly?
- c. Before the problem happens, what kind of repairing and service work have been done for the machine?

Step 6: Re-Show Problem Symptom

- Operate the machine and tell if the machine just has the problem that has been reported.

Step 7: Trouble Remedy

- (1) Confirm the problem location.
- (2) And determine measures to be taken to remedy the problem.
 - a. Before remedying the problem, confirm where is the location of the problem, and then fix it.
 - b. Please see the section of " Trouble-Shooting", fix the problem in the steps as stated in "Trouble-shooting process".

6.2.4 Methods for Trouble Diagnosis

The methods for trouble diagnosis can be classified into several types: making diagnosis by disassembling/ none-disassembling the machine; and experience diagnosis or tools-diagnosis (i.e: by employing instrument, gauges or special tools to make diagnosis for the machine problem). Of course, during diagnosing machine problem by means of disassembling or none-disassembling, the tools, including: instruments, gauges or special tools can also usually be adopted.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



None-Disassembling Diagnosis (by Experience)

During machine driving or working, if there is something wrong happening on the machine, the operation can diagnose the problem by "watching, listening, touching, smelling and asking", to figure out the problem location and causes. Afterwards, fix the problem.

"Watching" ---- meaning visible inspection. Observe the machine all around to see if there is any leakage (water, oil and air leakage), cracking, out-shaping, breaking or unfastening, and see if the instrument panel can show correctly. And check if the lubricating oil is out its quality. And inspect if the emission color of engine exhaust is acceptable after the machine engine being started. From all these visible inspection, you can basically tell where the problem is located and what is the possible reason of the problem.

"Listening"---meaning if you can hear ab-normal sound producing from the machine during it driving or working. Knock at gently, with a thin and long metal bar or a screw-driver, the possible trouble location (such as: gearbox, torque converter, diesel oil, gear pump etc.) to hear if there is any ab-normal sound producing from those moving parts. By the method of "Listening", you can possibly tell the problems that may happen inside the moving parts.

"Touching"-meaning to touch the machine body, with hand, to feel machine temperature of vibration.

"Smelling"---meaning to tell if there is any ab-normal smell from the machine body (especially from diesel oil or gearbox) by smelling.

"Asking"---meaning to ask the witness people if they have seen or heard anything wrong about the machine, or to ask the machine operator about the operation performance of the machine before the problem happens, so that you can get the first-hand information about the machine problem.

The none-disassembling method for diagnosing machine trouble is very efficient and economic to initially tell the machine problem location and reason, without employing checking instruments and special tools.

None-Disassembling Diagnosis (by means of Checking Instrument)

The meaning of none-disassembling diagnosis is to diagnose the machine problem and to inspect machine quality by means of using checking instruments or relative tools, which includes measuring gauges (oil pressure gauge or cylinder pressure gauges). This kind of method for diagnosing machine problems is very timely and very efficient to judge the machine problems.

Disassembling Diagnosis (by disassemble the machine)

This type of diagnosis method is basically used during repairing a machine, which also has two means specially: making diagnosis on the basis of previous experience; and making diagnosis by using instrument.

- a. Generally, when you encounter a machine problem, try best not to disassemble the machine to judge the problem. After initial judgment is made, then disassemble the specific component which is with trouble.
- b. If the machine is suddenly found with problem or the problem has been diagnosed, and it will affect badly the machine performance if the problem is not eliminated, then stop the machine and check it.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



For the troubles, for which you could not tell what wrong with it immediately, then move the control handle to the neutral position, and let the engine run at low idle, and at the same time keep a close watch on it and figure out what is a reason that causes the problem.

- c. If you find a way which can be used for effectively diagnosing a machine problem, especially a critical problem, and also find a solution to solve the problem, then write down your method and solution as archives for future reference.

6.2.5 Trouble Diagnosis Examples

A wheel loader is designed with many components and many complicated structures, so there maybe various reason for causing a machine problem. Therefore, for figuring out the reasons that cause the problem, you must study the problem phenomena first. So, on the basis of above-mentioned methods and process, find out reasons of the machine problem. In the followings, you will find several examples of trouble diagnosis for your reference.

(1) The engine is very hard to be started or could not be started up at all.

1) Symptoms

- a. When trying to start up the engine, the engine fan rotates very slow or you can hear a sound "Pata, Pata" sending from the electrical starter, and there is no any evidence of engine starting.
- b. The crank shaft of the engine can rotate, being activated by the starter, but the engine could not be started up, as you could not hear a special sound "Pupu Pupu", the sound that engine produces when it is successfully started, and further more you can not see the emission smoke.
- c. During starting the engine, you can not hear the constant "Pupu" sound. Although there is a little black or white emission smoke spraying out, but the engine could not be started.

2) Diagnosis process

For the first symptom, actually it is because that the starting speed is too low or the starting motor doesn't run at all. You should try to find the real reason from the engine starting system.

The substantial reason for causing the second phenomena is that there is not diesel oil in the air cylinder. Please try to find out the causes from the oil-supplying system.

While, for the third phenomena, as the matter of fact, the diesel oil has already come into the air cylinder, but has not combusted completely. Therefore, please try to figure out the reason in terms of the oil-supplying time, diesel oil quality and air-cylinder pressure and temperature.

In order to vividly illustrate the process of trouble diagnosis for the engine, we draw a figure (See Fig. 06-01) of diesel oil circulating route inside the engine:

During engine running, diesel oil passes, under the suction pressure of oil pump, through the coarse filter and flows into oil input pump. Then the diesel oil, after being pumped by oil output pump, will be sent to oil-injection pump via a fine filter.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



The diesel oil will be pressured in the oil-injection pump, then it comes to the oil-injection nozzle and is injected into the air-cylinder.

The remaining diesel oil in the oil-injection pump as well as the leaked oil from the injection nozzle will flow back to the diesel oil tank.

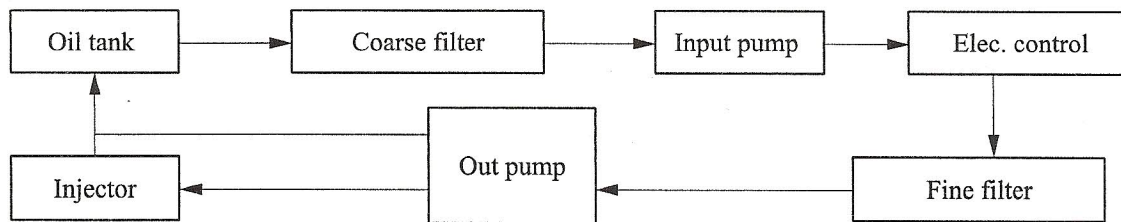


Fig. 06-01 Diesel oil circulating diagram

The process for diagnosing the problem that the engine is hard to be started up or could not be started up at all is shown in Fig. 06-02.

3) Reason analysis and trouble remedies

① Starting system problem

Press down the starting button, if you find that the fan turns very slow or doesn't turn at all, then the problem lies in the starting system. Possible reasons are:

a. Insufficient electricity or no electricity at all in battery

In case of starting the engine while the battery has insufficient electricity or no electricity at all, then you will hear the sound of engine running very hard and with low speed. And you will also find that the engine will stop after running a few turns or only one turn, or you will hear the sound from the starting motor. Then, what you need to do is to check the battery and to recharge it or replace it with a new one.

b. Problem in starting motor

The most-seen problems in the starting motors are:

- One-way clutch of the starting motor gets sliding, which cause the one-way gear also sliding;
- Bronze sleeve of the starting motor gets worn out, which results its rotator being damaged or poor connection to carbon-brush.
- Electric-magnetic switch does not work properly, or the motor wiring gets burnt.

So what you need to do is to disassemble the starting motor, and give it maintenance or service, or replace it with a new motor assembly.

c. Problem in the electrical cable connection

If the electrical cable connection gets loose, it will result poor connection, which, being as a result, will cause the starting motor could not work properly. Therefore, check the cable wiring or replace the relative electrical units.

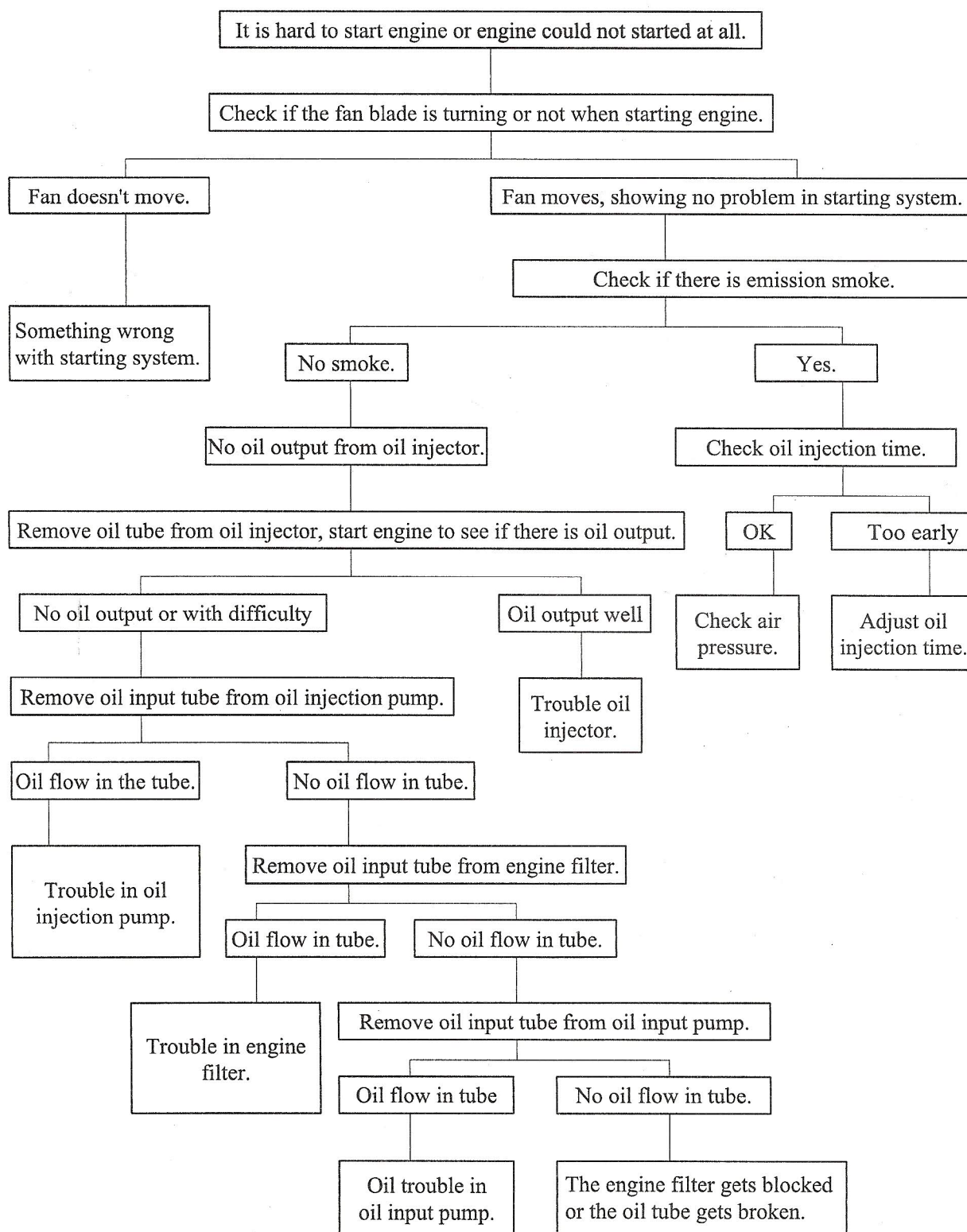


Fig. 06-02 Problem analysis process chart for the problem of starting engine with difficult

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



② Engine oil-supply system getting blocked.

Unscrew the connection fitting on the oil-input tube of the oil injection pump, and pump out oil with manual oil pump, and check if the oil flows smoothly. And at the same time, check the oil-return tube to see if it gets blocked, And also check the filter core to see if it gets blocked.

- a. Check the diesel oil level in oil tank. If necessary, replenish with fresh diesel oil.
- b. Check to see if the diesel oil filter gets blocked. If necessary, clean it or replace the filter core.
- c. Check the small oil filter at connection fittings of the oil-input tubes of oil pump. If necessary, clean it.
- d. Check the filter which is located at the oil tank (at the oil-output plug) to see if it is blocked. If necessary, make adjustment or replacement.
- e. Check if the oil-return loop gets twisted or blocked. If necessary, make adjustment or replacement.
- f. For some engines, there is a seam-type filter which is located at the oil-input fitting of the oil-injection pump. So it also needs to check it to see if it gets blocked.

What is worthy to be mentioned is: due to the season change and use of different types of oil, the

③ Air exists in diesel oil system

If finding the white emission smoke being exhausted out when the engine is started, but you could not start the engine successfully at all, then firstly check the sealing status for oil-supply system.

- a. Check if there is any leakage from the connection fittings of oil tubes. And check if the tubes are well fastened. At some oil leakage points (particularly any oil leakage points in front of the oil pump) , there will be possibility to let air penetrate into the diesel oil system.

Please be kindly noted: On some diesel engine, over-flow valve is also fixed on the oil-return loop. If the overflow valve is not well sealed or its spring gets damaged, it will also cause air to come into the oil system. So often check the sealing status of the overflow valve.

- b. If there is air in the oil-supply system, firstly you need to bleed out air from the oil system. Unfasten the air-bleeding screw on the oil-injection pump or the air-bleeding screw on the diesel oil filter, afterward, pump oil with manual oil-pump. If air does exist in the oil system, then you will find air-bubble in the oil during oil draining. Keep draining oil for bleeding air out till there is no air-bubble anymore in the oil flow. At the same time, pump oil with manual oil pump while you try to re-fasten the air-bleeding screws. Finally, have the manual oil pump positioned.

Restart the engine. If finding the engine rotation speed is not enough and hearing "hunu,hunu" sound from the engine emission tubes, however, engine still could not be started successfully, then it means there is air in the oil tubes or in the oil pump. Then, what you need to do is to unfasten the tube fittings of the high-pressure oil tube at the oil-injection pump, and have the starting motor turning the engine, so as to bleed out air form the oil-injection pump. After there is no any air-bubble anymore in the oil flow from connection fitting, then fasten securely the tube fitting of the high-pressure oil tube. Afterwards, restart the engine again, then there should be no problem to start it.

Please be kindly noted: When you bleed air out the oil-injection pump in this way, you should do it quickly and in intermittence, otherwise it will cause the starting motor and the battery to be damaged.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



④ Insufficient oil output or no oil output at all from the oil pump

When the engine runs by means of the starting motor, there should be oil spray from the air-bleeding screw on the oil-injection pump. Otherwise, it show the oil pump does not work properly. When finding that there is not sufficient oil output or no oil output at all from the oil pump, then disassemble the pump for checking.

- a. The main reasons for insufficient oil output from oil pump: The oil pump filter getting blocked; improper sealing for the oil valves (oil input valves and output valves); mal-function of the pump spring ; the pump piston or pump body itself getting worn out; etc. Remedies: Clean or replace the filter at the connection fittings, get the valves sealed well, replace the pump spring, replace the pump piston, and repair the connection fittings.
- b. Main reasons for none oil output from oil pump: pump spring getting broken, oil valves getting damaged, oil-leakage from oil-input tube. Remedies: to replace spring, repair valves (if necessary, replace them), or repair oil tubes or their fittings (when necessary, replace oil tubes).

⑤ Insufficient oil output or no oil output from oil-injection pump

- a. Main reasons for insufficient oil output from oil-injection pump: not well sealing for oil valve, causing oil leakage; pump piston getting worn out , causing oil leakage; improper adjustment for oil injection amount; air penetrating into oil-supply system.
- b. Main reasons for no oil-output from oil-injection pump: pump piston getting jammed; or piston spring getting broken, etc.

Please be kindly noted: Normally the oil-injection could not be given adjustment. If it has to be adjusted, then such adjustment must be executed on a special testing table by a professionally experienced service people. Never willfully "repair" the oil-injection pump. But the external problems can be repaired and adjusted, such as: air-bleeding or adjusting oil throttle.

- c. If the engine shut-off lever is not restored to its original position, it will also cause the oil-injection pump to have the problem of insufficient oil output or none oil output. So check and figure out what's wrong with the shut-off level and fix the trouble.
- d. In case it is hard to start the engine or the engine could not be started at all after it is just shut off, the main reason for this kind of trouble phenomena is the pump piston and piston sleeve got severely worn out, which results the oil leakage from the piston or piston sleeve that is worn out. This is just the reason why there is insufficient oil output or none oil output from the oil-injection pump.

⑥ Poor performance of oil-injection pump

The normally-seen trouble of oil-injection pump is oil leakage or poor vaporization.

- a. Reason for oil leakage or poor vaporization : oil-injection pressure gets decreasing due to the spring being broken or improperly adjusted; the needle valve gets worn out or out-shaped; the valve couples clamp too tightly or too loosely. Remedies: disassemble the oil-injection nozzle for adjusting or replacing the pressure spring, or replace the valve couples.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



- b. The main reason for none oil-spraying from oil-injection nozzle is the valve couple gets fully blocked. Remedy: replace the valve couple. Please be kindly noted: the needle valve must be replaced together with the valve body itself. Before replacement, clean it and check the needle valve. After installing a new oil-injection nozzle, test it on a special testing table to testing oil-injection pressure, and at the same time, check its vaporization status.

⑦ Too large oil-injection angle

During the operation of the diesel engine, if the oil-injection angle is too much, the pressure inside the air-chamber can be increased very highly before the pump piston travels to its stroke limit. The larger the angle is, the higher pressure will be inside the air-chamber, which will make it difficult to start the engine.

- a. How to check the trouble caused due to too large oil-injection angle: firstly pull out the engine shut-off level to stop oil supplying to oil-injection pump, engage the starting motor and let it run for turning the engine for about 3-5 seconds. Then the starting speed will get high, then restore the shut-off level immediately back to its original position, at the same time step down the accelerator. Hopefully, you will successfully get the engine started.
- b. When you check the oil-injection angle, firstly you need to bleed out the air from the oil-supplying system. Then unfasten the high-pressure fitting at one end of oil-injection pump, clean the floating oil at the fitting, and adjust the oil-injection speed adjustment lever to its maximum throttle position. Slowly turn the crank shaft, and observe the oil level in the oil output tube. When finding the oil level begins fluctuating, stop turning the crank shaft. Then the scale as shown on the fly-wheel is just the oil-injection angle.

If finding the oil-injection angle is not within its range as required, then give it adjustment timely.

⑧ Low-pressure in air-chamber

- a. The reason for low-pressure air-chamber: too much clearance between the piston ring and piston wall, causing air leakage; poor sealing for the throttle or throttle seat, or the throttle seat being burnt down; air-chamber washer being damaged or air-chamber cover being out-shape, causing air leakage; sealing pad for oil-injection nozzle being broken, causing air leakage.
- b. Dismount off the oil-injection nozzle, and install a pressure gauge at the nozzle seat. Pull out the engine shut-off lever to stop oil supplying to oil-injection pump. Have the starting motor running for about 2-3 seconds and write down the pressure reading. Dismount the pressure gauge, and fill in a little amount of engine oil (about 50ml) into the oil-injection nozzle. After one minute, measure the pressure again. If finding the pressure is larger than the previous ones, then you can judge the clearance between the piston and air-chamber wall is too large, which just causes the air leakage. If finding the pressures of two-time measurement is still low, without difference, then you can tell that the air-chamber pad is broken or worn out.

⑨ Other reasons

- a. The ambient temperature is too lower, and the engine oil viscosity is too large, which causes too

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



much resistance for machine starting. Also, as the temperature inside the air-chamber is also very low, which means the diesel oil could not be combusted completely, causing difficulty to start the engine.

- b. The air filter gets blocked, causing insufficient air take-in, which, being as a result, brings much difficulty to start the engine.
- c. Improper adjustment for air take-in also makes it difficult to start the engine, as the insufficient air pressure or wrong arrangement for air take-in or take-out.
- d. Improper adjustment for the air throttle clearance results insufficient air take-in, too much air remaining inside the air-chamber or air leakage, which also makes it difficult to start the engine.

Remaining: If an engine can be started successfully only one time, it means the engine has a very good starting system. But if it could not be started in one time, it doesn't mean the engine has the trouble in terms of starting. So, please be sure if you get everything ready to start the engine.

As a matter of fact, under the temperature above -5°C , make sure preparation and maintenance work are surely be done. Generally speaking, an engine which is with good starting system, should be started within 3 times. In case it could not be started within 3 times, check it and figure out the reason prior to attempting to re-start it again.

(2) Engine runs without power output (insufficient power)

1) Symptom

The symptom of the problem that the engine runs with power output (insufficient power) normally is: The engine runs at very low speed even after the accelerator pedal is stepped down, while its emission tube sending off heavy smoke. At the same time, the engine temperature gets higher easily and quickly.

2) Process of trouble diagnosis

There are several reasons for causing the problem of insufficient power. Basically, the reasons are: insufficient air take-in, insufficient oil supplying, improper oil-injection angle, insufficient pressure in air-chamber, etc. Please see the detailed process for diagnosing this kind of problem (See Fig. 06-03).

3) Reasons analysis and trouble-shooting remedies

- ① Air filter being blocked

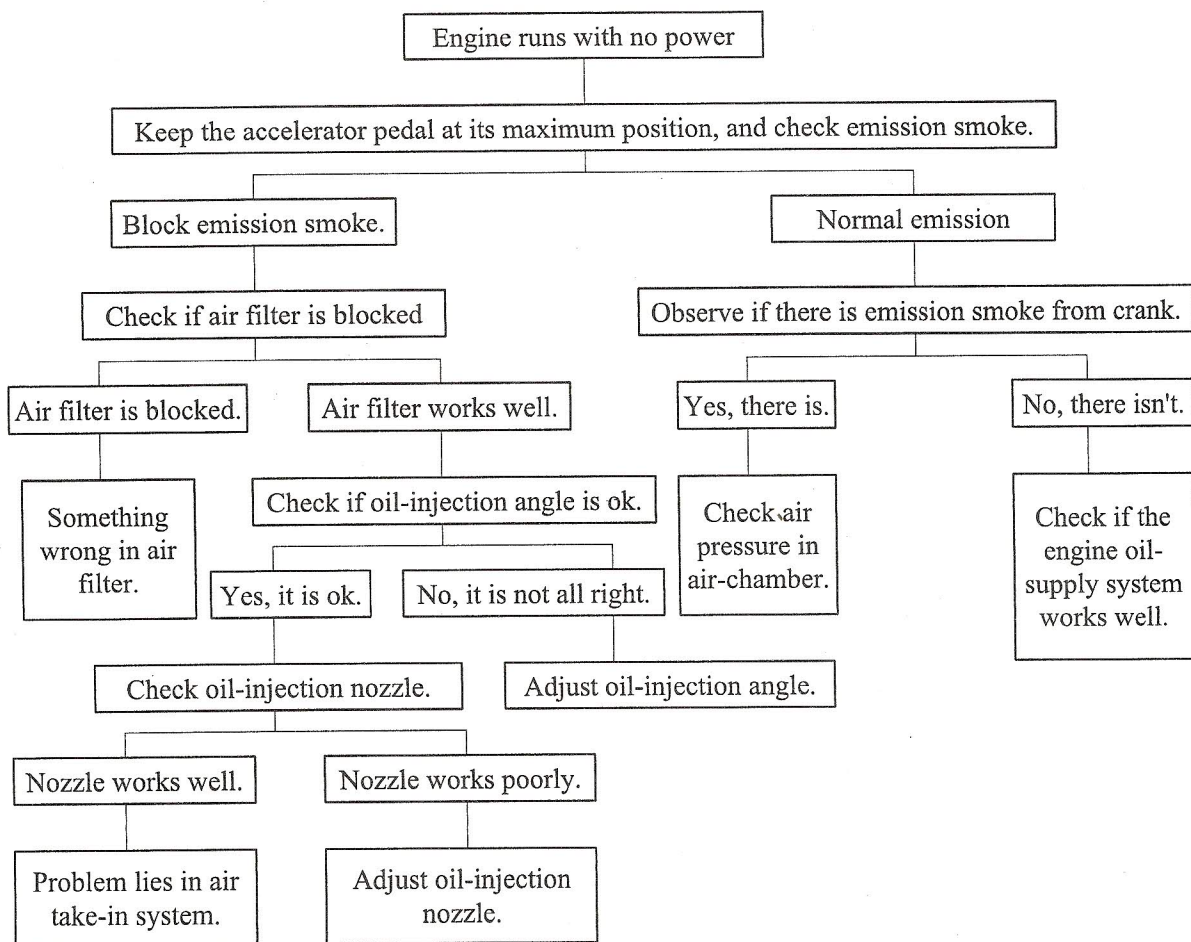


Fig. 06-03 Process chart for analyzing the problem that the engine runs without power

If the air filter gets blocked, it will directly affect the air take-in volume in the air-chamber. As the diesel oil must be fully mixed with air which is with high temperature and high pressure, it can completely combusted. So, if the air take-in is not enough, then some part of diesel oil which has sprayed into air-chamber will not combusted but will dissolve under high temperature and high pressure, so it will turn into gas and carbon and be emitted in the way of black smoke. So, this type of trouble is always accompanied with black smoke emitted from the exhausted pipe.

② Engine runs very slow at high idle

If the engine runs very slow at high idle, it will reduce the oil injection volume, causing insufficient power output from the engine. Normally, the running speed change of the engine at high idle is caused because the accelerator lever is not correctly positioned or the high-speed limit screw on the oil-injection pump gets loose. Place the control level at the neutral position and set the speed adjustment lever of oil-injection pump to its maximum position, which is also the maximum speed at high idle. If such speed is very low at high idle, then check it and figure out reason.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



③ Problem in oil-supply system

- a. The engine oil circuit gets blocked, causing insufficient oil supply.
- b. There is not enough oil output or none oil output at all from the oil pump.
- c. There is not enough oil injection or none oil injection at all from the oil pump.
- d. The oil-injection nozzle can not work properly.

As for the problem analysis and trouble-shooting remedies, please see what has been mentioned above for details.

④ Improper adjustment for the oil-injection angle

Improper adjustment for the oil-injection angle will not only cause insufficient power output but also severely damage the engine.

- a. If the oil-injection angle is too large, the engine oil will be sprayed into air-chamber prematurely. At this time, as the temperature and pressure in side the air-chamber is still low, so the engine oil which has been sprayed into air-chamber could not combust fully, .Which causes the machine problem of insufficient power output. In addition, even during the engine oil combustion, the sudden pressure increasing will also get the air-chamber be shocked or vibrated, so too much oil-injection angle will be always accompanied with premature wearing of the air-chamber.
- b. If the oil-injection is too little, then the engine oil could not be well mixed with the air, as engine oil can only stay in air-chamber for only very short while, therefore the engine could not fully combust, so some part of engine oil that has already sprayed into the air-chamber will be emitted out together with the exhaust emission and still keep combusting in the emission tube, causing the engine power decreased.
- c. Normally, the higher speed the engine runs at, the larger the oil-injection angle will be. In order to meet the requirement of having the engine running at high speed, many engines are installed with automatic oil-injection angle regulators. However, if the automatic regulator is damaged, it will also cause poor combustion for the engine oil, so, if necessary, please repair it.

⑤ Improper adjustment for air take-in

Improper adjustment for the air take-in (with air throttle being too large or too small) will cause insufficient air take-in for or air leakage from the air-chamber, which, being a result, will affect negatively the engine power, so regular check, adjustment or maintenance is necessary.

⑥ Low pressure in the air-chamber

If the piston, piston ring or the piston sleeve of the air-chamber gets worn out, the problem of air leakage will be caused, leading the low pressure in the air-chamber and power loss of the engine. Normally, if the piston, piston ring or the piston sleeve is broken or worn out, there will always be a problem phenomena that emission smoke is emitted out form the engine crank.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



In addition, the poor sealing for the air throttle or the throttle seat can also contribute to the low pressure in the air-chamber.

(3) Machine Works With No Power

1) Problem Symptoms

- a. No high speed when the machine runs without being loaded. It seems there is no power for machine traveling.
- b. The machine has high speed and also runs fast, but there is no power when it works with being loaded.
- c. The machine has high speed, but there is no power during its running or working.

2) Diagnosis Process

Please see the figure 06-04 for more details of diagnosis process for the problem that the machine works without power.

3) Problem causes and remedies

- ① The normal working pressure of the gearbox is 1.6~1.8MPa, with minimum pressure not less than 0.85MPa. If the pressure of the gearbox is below 0.85MPa, then it is unacceptable. The main causes are:
 - a. The oil level in gearbox is too low, so replenish with fresh transmission oil to proper level.
 - b. The pressure-adjustment spring of the gear-control valve is damaged, or the valve is jammed or pressure is not properly adjusted. So check and replace the valve.
 - c. The gear-shifting pump is broken down, so replace the pump.
 - d. The filter for transmission oil container gets blocked. So, figure out the reason how the filter is blocked, and clean or replace the filter. If finding there are some metal partials in the filter, then it needs to check the converter or gearbox by disassembling them.
 - e. The gear-control valve is jammed, so check it by disassembling it.

② It is due to the problem in torque converter.

The main problem symptoms for torque converter are oil leakage or its internal parts being damaged.

- a. If a part inside the converter is damaged, you will hear strange sound. Then if you check the oil-pan of the torque converter, you will find some aluminium partials, then check the converter and replace its damaged parts in time.
- b. Oil leakage from the torque converter: If finding any oil leakage from the torque converter, please check it and replace the sealing O-rings.

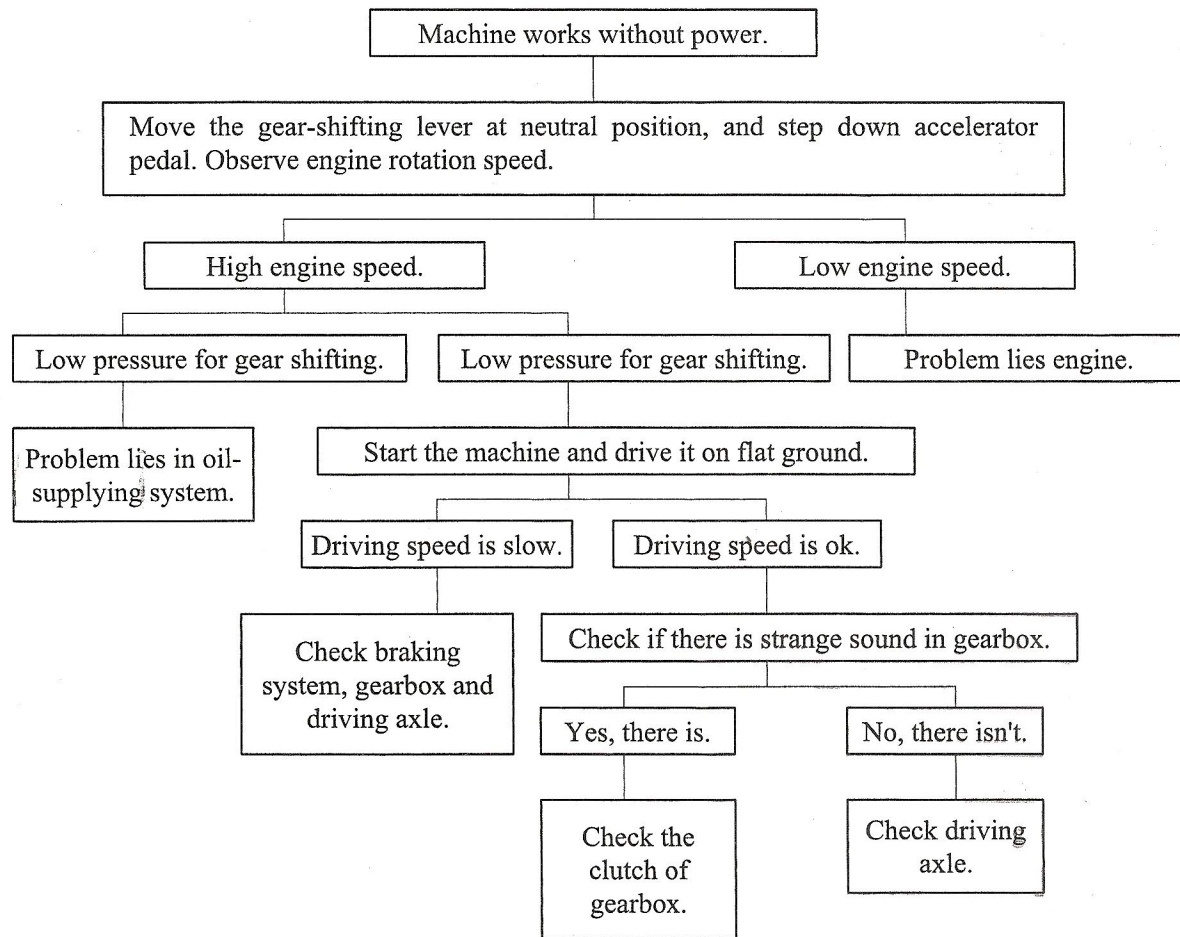


Fig. 06-04 Diagnosis process chart for the problem that that machien works without power

③ Breakdown of driving axle

The normal symptoms for the breakdown of the driving axle are: screw taper gear being broken, differential gear being broken or cracked.

- There is strange sound from driving axle if the screw taper gears are broken.
- You can hear strange sound when making steering if the differential gears are broken.
- If finding the gears inside driving axle is broken or cracked, please remove off the oil-drainage plug for draining oil. And you will find metal partials inside the oil, then you need to disassemble the driving axle and give it check or repair.

- The improper adjustment for the gear-selector joystick can also cause the problem that the machine works without power. So please check if the gear-selector can flexibly be moved, with clear gear range. If necessary, please re-adjust it.

6.2.6 The diagnosis Process Charts for Other types of Problems on the Wheel Loader

In order to help service people better judge and solve some other normally-seen problems on the

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



wheel loader, we also outline the following diagnosis process charts for the reference to maintenance and service people.

- The engine runs, but the machine doesn't move (See Fig. 06-05).
- The pressure of service braking system is not enough (See Fig. 06-06).
- The machine doesn't make steering when steering-wheel is operated (See Fig. 06-06).
- Oil temperature of the torque converter and the gearbox is too high (See Fig. 06-08).
- There is not enough force (pressure) to raise boom or bucket (See Fig. 06-09).

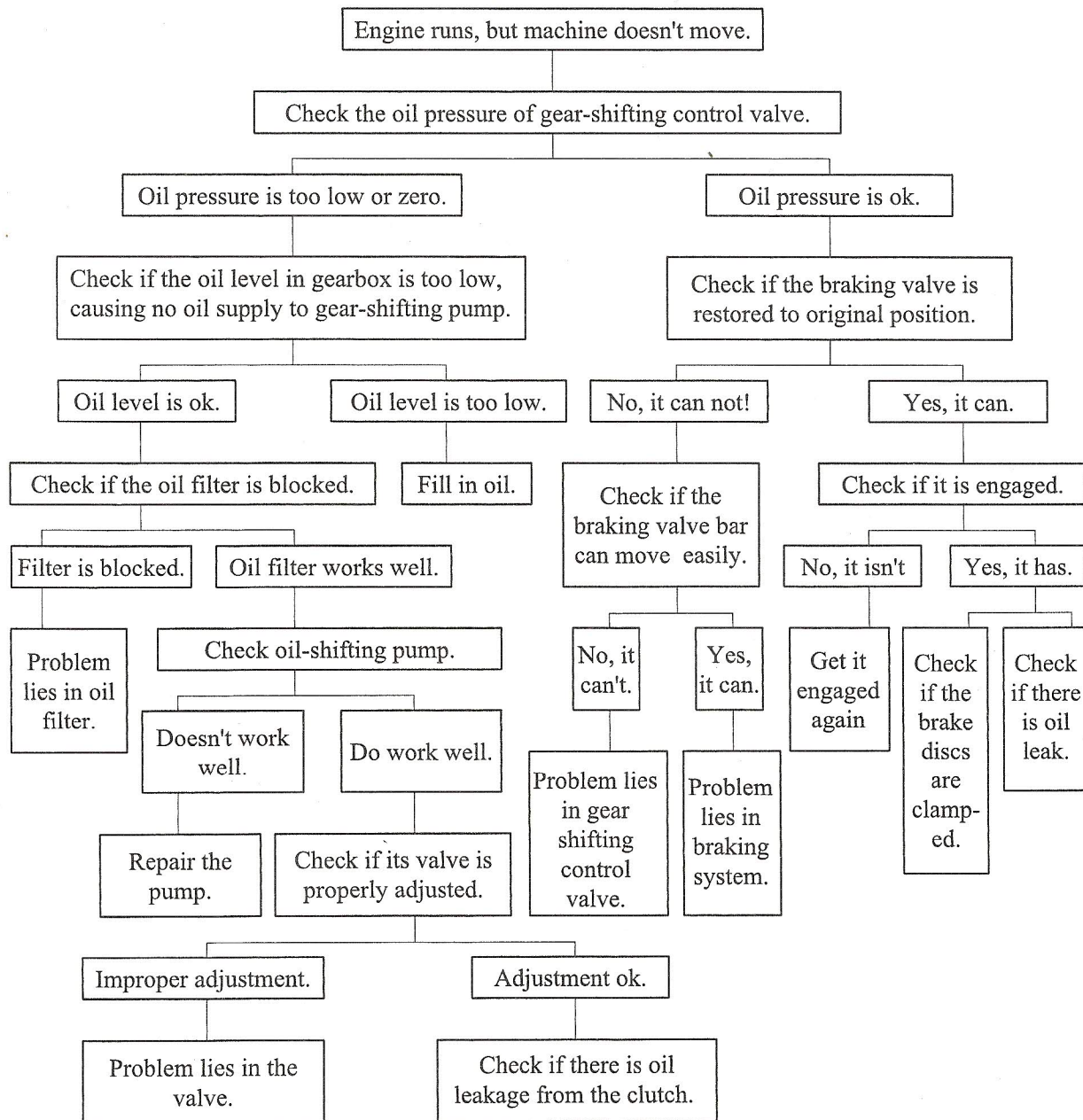


Fig. 06-05 Diagnosis process chart for the problem the machine doesn't move while engine running.

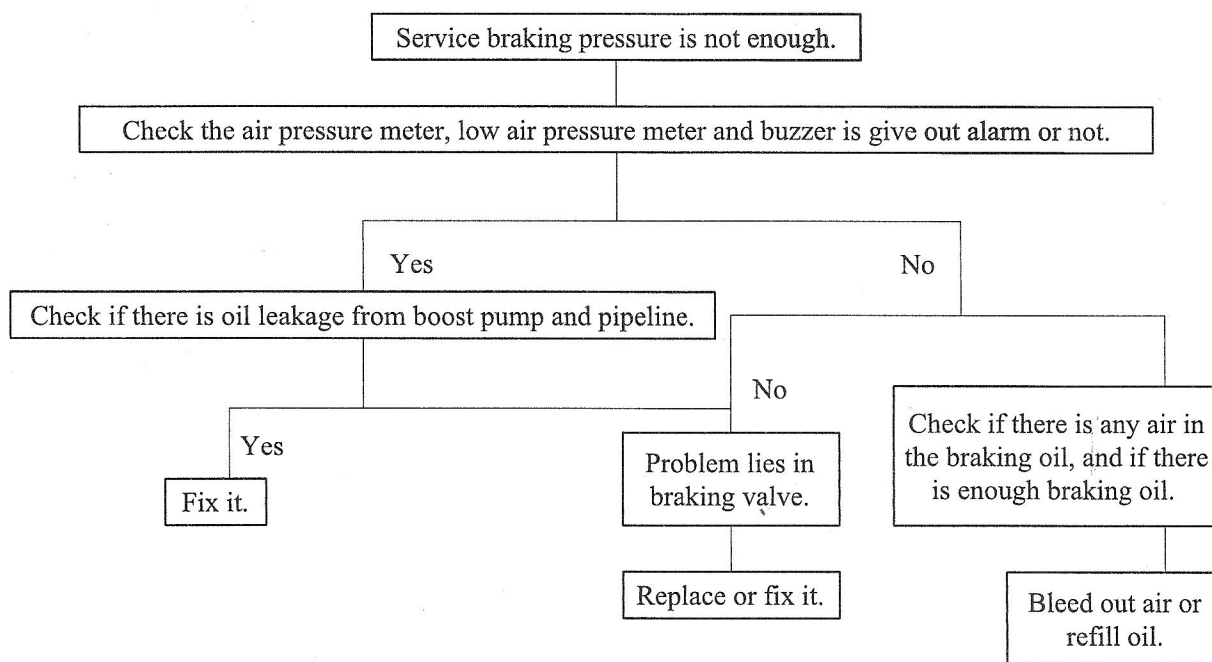


Fig. 06-06 Diagnosis process chart for the problem of insufficient braking pressure

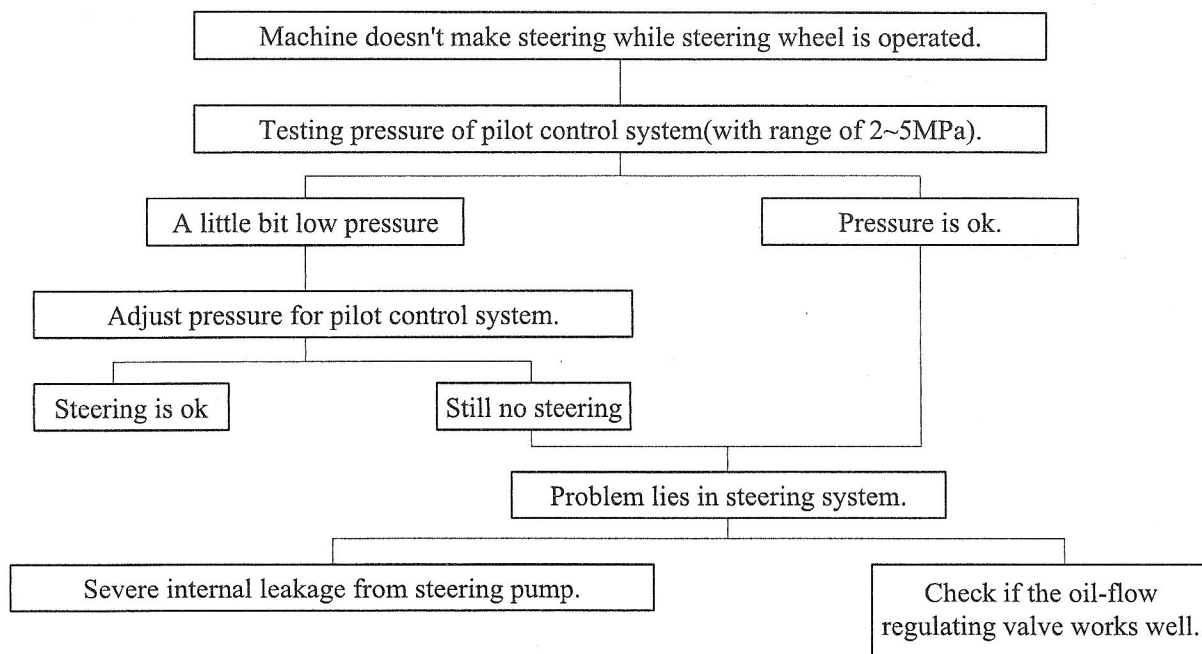


Fig. 06-07 Diagnosis process chart for the problem that the machine doesn't make steering while the steering-wheel is operated

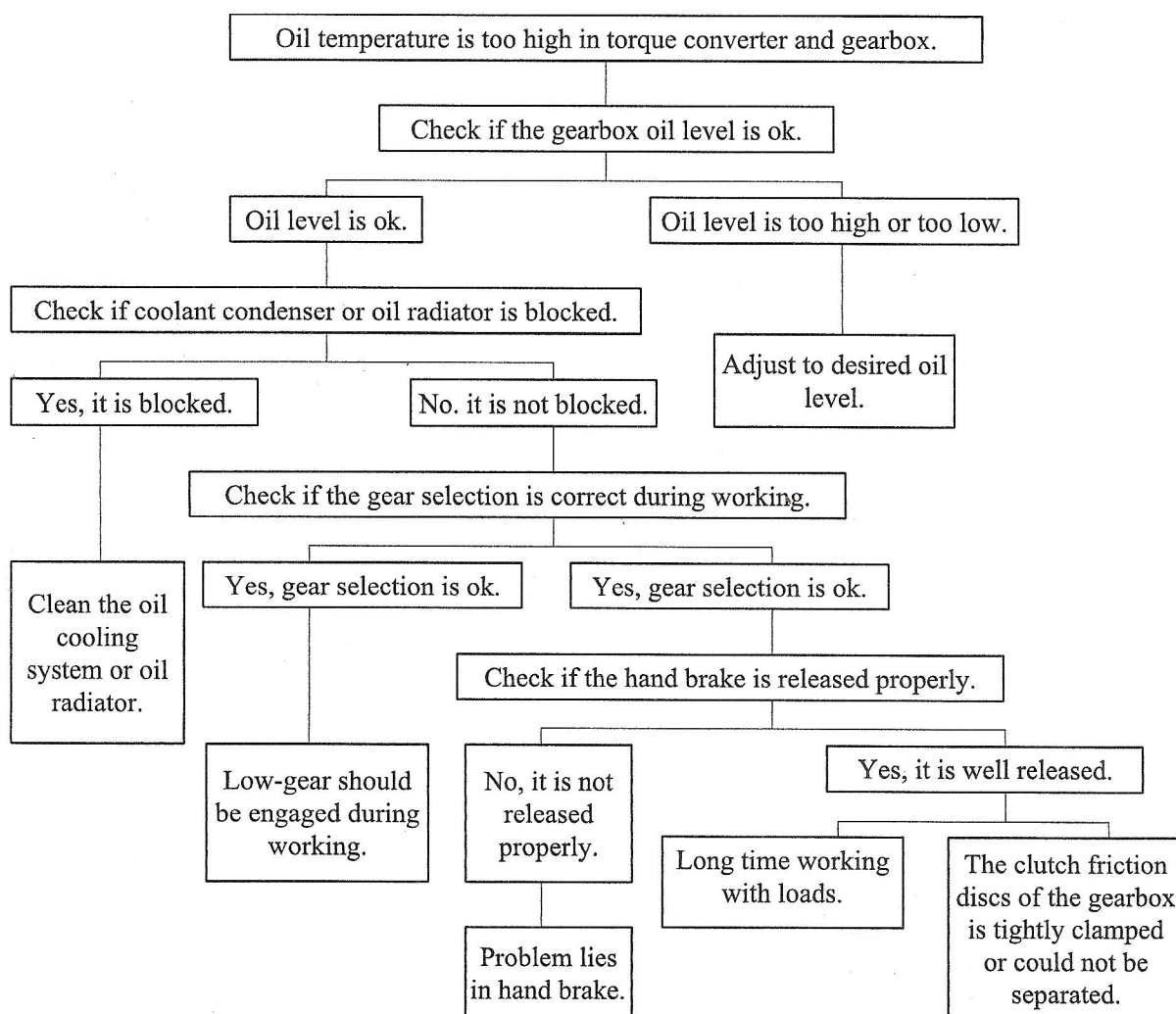


Fig. 06-08 Diagnosis process chart for the problem that the oil temperature of the torque converter and the gearbox is too high

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies

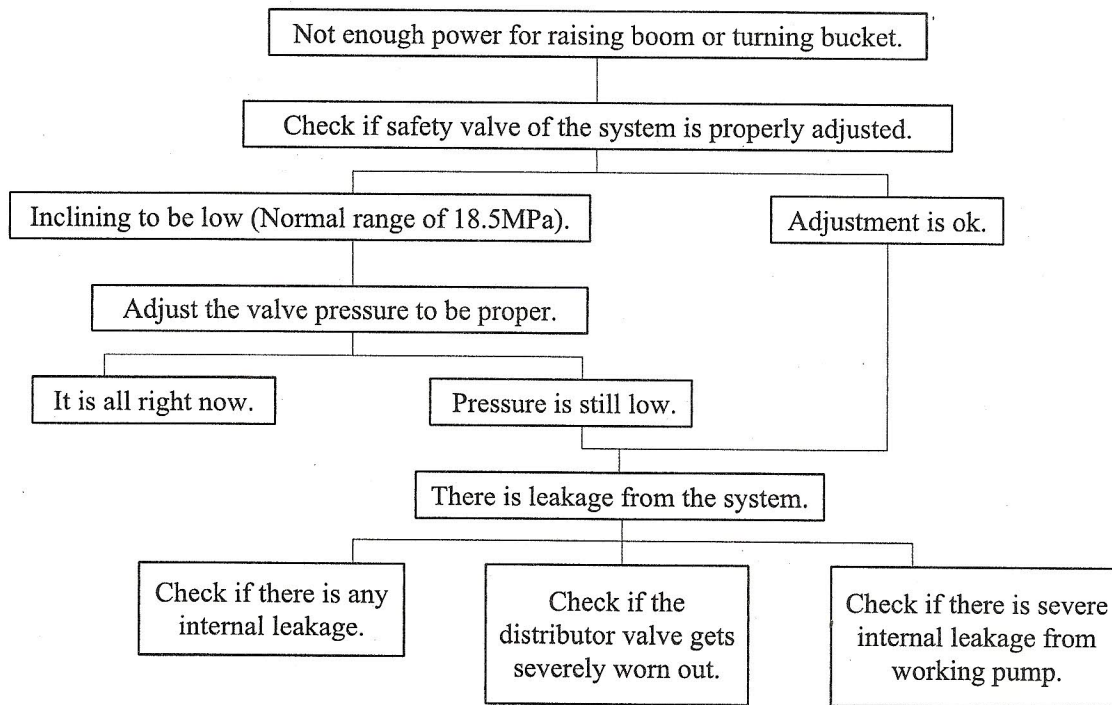


Fig. 06-09 Diagnosis process chart for the problem that there is not enough power to raise the main boom or to turn the bucket

2.7 Problems Analysis Process Charts for the Main Components (See Fig.06-10---06-17)

(1) Gearbox (Please refer to the Figure 04-19 for the testing points numbers as shown in the chart)

a. Oil pressure is low for all the gear ranges

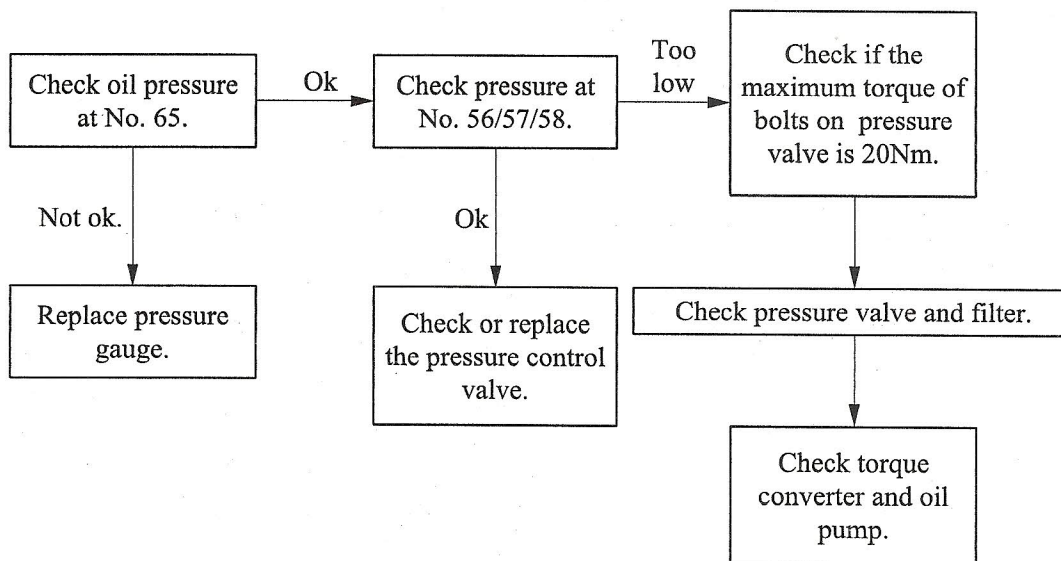


Fig. 06-10 Analysis process chart for the problem that oil pressure at all gear range is low

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b. Too short time for gear-shifting

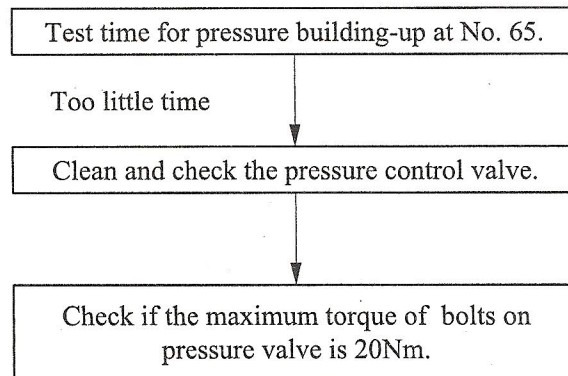


Fig. 06-11 Analysis process chart for the problem that time for gear shifting is too short

c. Too long time for gear shifting

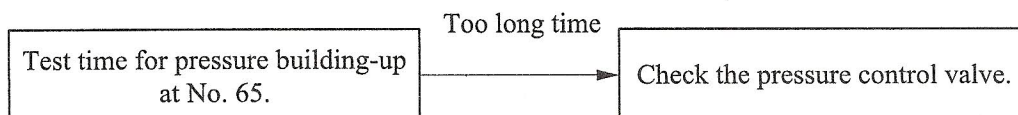


Fig. 06-12 Analysis process chart for the problem that the time for gear shifting is too short

d. Oil temperature is too high

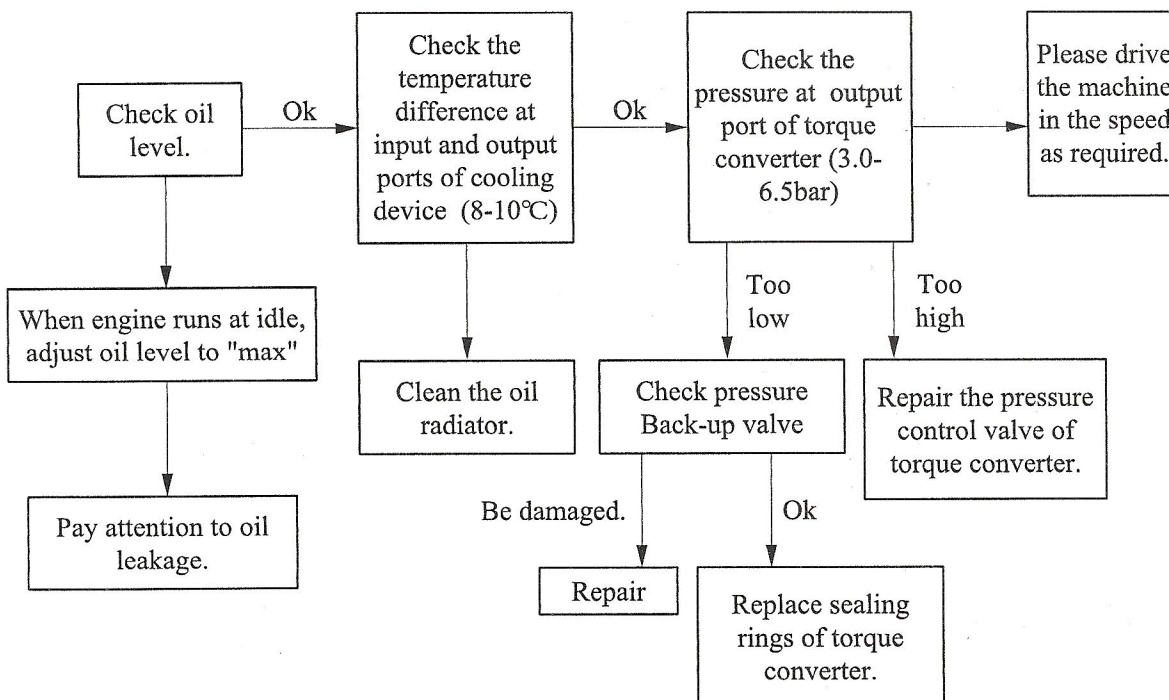


Fig. 06-13 Analysis process for the problem that oil temperature is too high

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



f. There is no 1st-gear either 2nd-gear

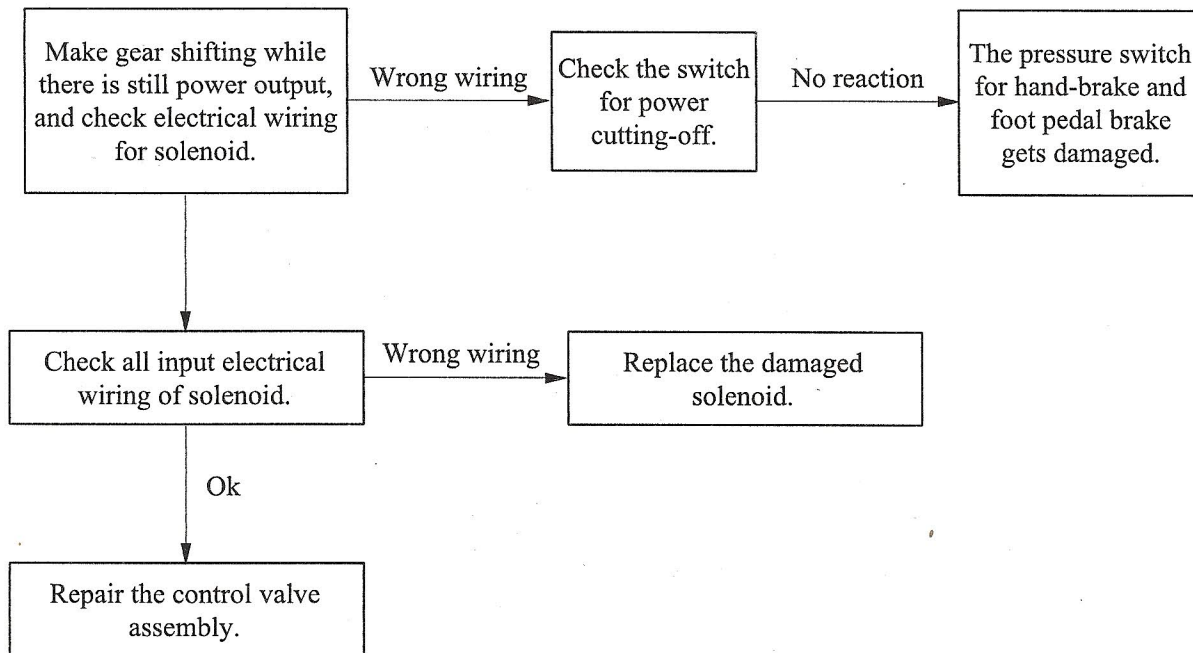


Fig. 06-15 Analysis process chart for the problem that there is no 1st gear either 2nd gear

g. Traction force gets decreasing and oil temperature gets high

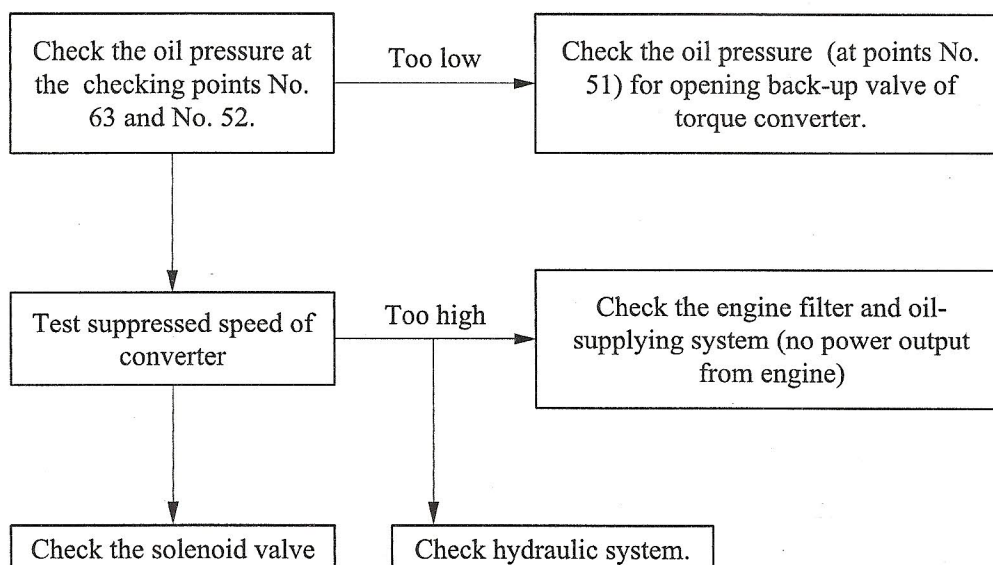


Fig. 06-16 Analysis process chart for the problem that the traction force gets decreasing and oil temperature gets high

(1) Battery

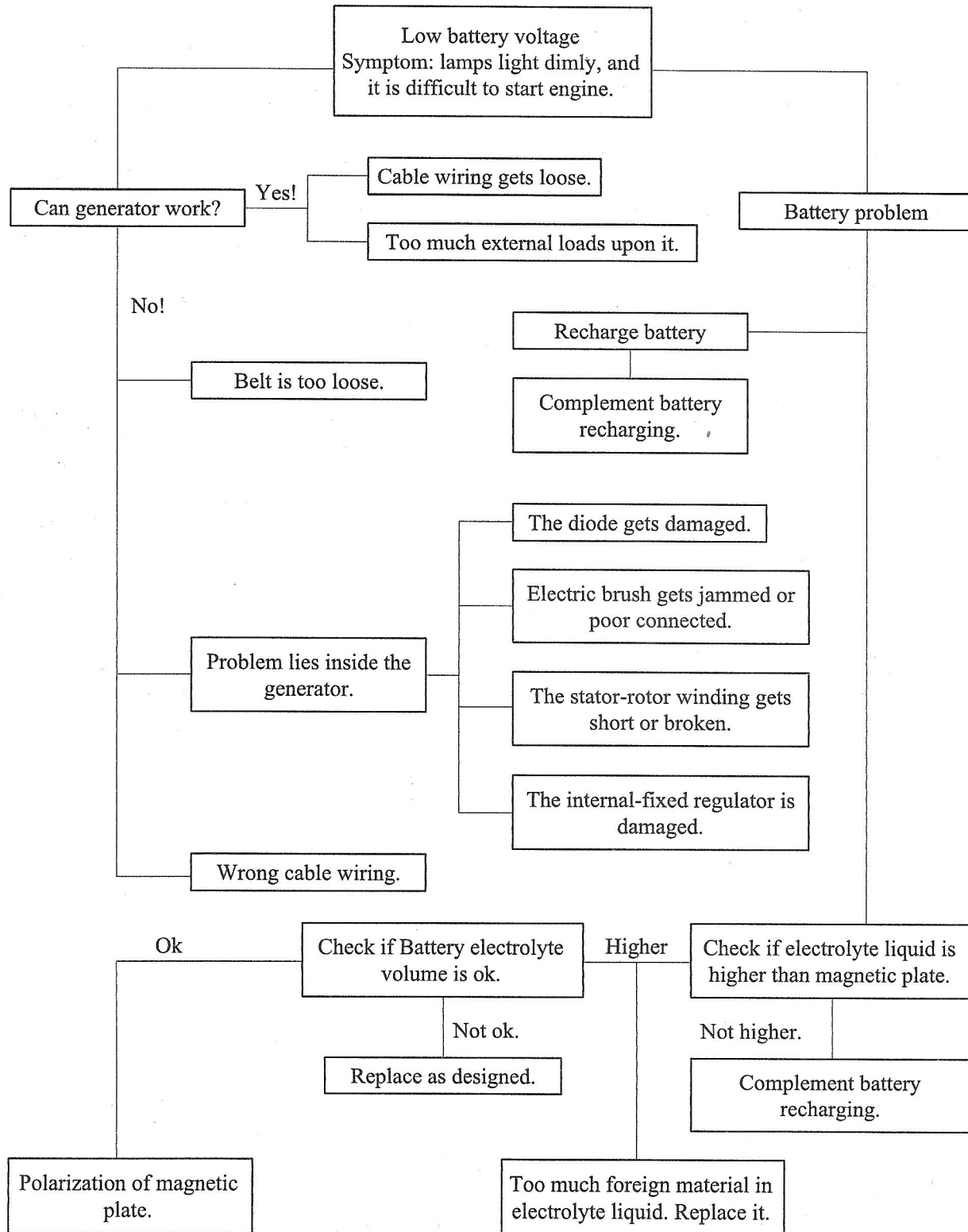


Fig. 06-17 Analysis process chart for the problem of the battery problem



6.3 Causes And Remedies for Common Troubles

6.3.1 Power system

Trouble symptoms	Causes	Remedies
1. The engine could not be started.	1. Insufficient battery voltage. 2. Engine oil being too low. 3. The pipelines of diesel oil get blocked or air comes into pipelines. 4. Engine oil filter being blocked. 5. Diesel oil pump fails to work or only works un-continuously. 6. Breakdown of starting motor.	1. Recharge or replace battery. 2. Replenish oil to desired level. 3. Bleed air out pipelines or repair pipelines. 4. Clean or replace. 5. Repair or replace. 6. Repair or replace.
2. Other engine-related troubles.	Please see the specific Engine Manual for details.	

6.3.2 Transmission system

(1) Torque converter and gearbox

Trouble symptoms	Causes	Remedies
1. Oil temperature is too high.	1. Oil level being too high or too low. 2. Clutch gets sliding. 3. Oil quality gets dirty or deteriorated. 4. Oil radiator fails to work. 5. Long time working or working with over-load. 6. Foreign stuffs in torque converter.	1. Fill in oil to desired level. 2. Check and repair. 3. Replace. 4. Clean or replace. 5. Stop machine to let temperature cool down, and avoid working with overloads. 6. Repair or replace.
2. Low oil pressure.	1. Improper adjustment for pressure valve. 2. Oil filter gets blocked. 3. Gear-shifting pump gets severely worn. 4. Oil leakage from the clutch.	1. Make adjustment. 2. Clean or replace. 3. Replace. 4. Check and replace.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



Trouble symptoms	Causes	Remedies
3. Machine doesn't move after gear-selector joystick being engaged.	1. Hand brake is not released. 2. Low oil level. 3. Failure of torque converter. 4. Low oil pressure.	1. Release hand brake. 2. Refill oil to desired level. 3. Check and replace. 4. Please see Item 2.
4. Insufficient driving force.	1. Low oil pressure. 2. Oil leakage from torque converter and other oil pipelines. 3. Failure of torque converter. 4. Braking system is not fully disengaged.	1. Please see Item 2. 2. Check and repair. 3. Replace. 4. Check and repair. 5. Get braking system fully disengaged.
5. Gear selection gets messed up.	1. Breakdown of gear selector. 2. Breakdown of gear-shifting control mechanism.(Electrical control unit)	1. Check, repair or replace gear-selector. 2. Replace the electrical control unit.
6. Gear could not be engaged.	1. Hand brake is not released. 2. Low oil pressure in gearbox. 3. Pipelines get blocked.	1. Release hand brake. 2. Please see the description about Trouble No. 2. 3. Clean or replace.
7. Machine moves when it is cold, but it doesn't move when it is warmed up.	1. Oil is not clean 2. Gear-shifting pump gets worn out.	1. Replace 2. replace

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



(2) Driving Axle

Trouble symptoms	Causes	Remedies
1. Too much noise.	1. Improper clearance for the gear engagement. 2. Breakdown of the bearing. 3. Cross-shaft wears severely. 4. Insufficient lubricating oil.	1. Adjust or replace. 2. Replace. 3. Replace. 4. Fill in oil to desired volume.
2. There is strange sound when making steering.	1. Improper engagement for the differential gears. 2. Improper clearance between planetary gear and cross-shaft.	1. Adjust or replace. 2. Adjust.
3. Being too hot.	1. Too little clearance between gears. 2. Too much or too little lubricating oil, or lubricating oil quality gets deteriorated.	1. Adjust. 2. Fill in oil to desired level or replace oil.

6.3.3 Hydraulic System

(1) Hydraulic system of steering mechanism

Trouble symptoms	Causes	Remedies
1. It is quite heavy to make steering	1. Too low oil temperature. 2. Filter gets blocked. 3. Pressure for overflow valve is set too low. 4. Steering units clamp too tightly. 5. Hydraulic oil viscosity gets too thick.	1. Operate machine after hydraulic oil temperature is warmed up. 2. Clean or replace. 3. Adjust pressure of overflow valve. 4. Check, repair or replace. 5. Replace the hydraulic oil with recommended oil viscosity.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



Trouble symptoms	Causes	Remedies
2. The steering wheel can still be turned when it has been moved to its travel limit.	1. The position-limit mechanism or position-limit valve fails to work. 2. Breakdown of steering mechanism	1. Check and repair the position-limit mechanism or valve. 2. Replace.
3. Steering is not stable.	1. The performance of flow-amplifying valve is not stable.	1. Check, repair or replace.
4. Steering to both left and right is very slow.	1. Oil flow-amplifying valve is set at low pressure. 2. Internal oil leakage from steering pump. 3. Filter gets blocked. 4. The valve bar for oil flow-amplifying valve can not move to its travel limit.	1. Add,more adjustment pads. 2. Check or replace 3. Clean or replace 4. Adjust the pilot control oil pressure or replace spring.
5. It is very quick to make steering to one side, but it is slow to another side.	1. The adjustment pads at both ends of the valve-bar of flow-amplifying valve.	1. Adjust the adjustment pads.
6. Steering mechanism works well when steering resistance is little, but steering will be always slow when steering resistance getting much.	1. Oil leakage from main oil circuit. 2. Oil leakage from shuttle-valve. 3. Low oil pressure from steering system.	1. Check, repair or replace. 2. Check, repair or replace. 3. Adjustment.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



Trouble symptoms	Causes	Remedies
7. No steering at all.	1. Oil flow-amplifying valve fails to work. 2. Oil leakage from over-flow valve. 3. Breakdown of the pilot pump or steering pump. 4. Piston of steering cylinder fall off. 5. Breakdown of dual-way overflow valve. 6. The steering pin gets broken.	1. Check, repair or replace. 2. Check, repair or replace. 3. Replace. 4. Check, repair or replace. 5. Check, repair or replace. 6. Check, repair or replace.
8. Self-steering.	1. Breakdown of oil flow-amplifying valve .	1. Check, repair or replace.
9. Steering-wheel turns by itself.	1. Steering valve sleeve gets jammed. 2. The steering spring is broken.	1. Get rid of foreign staffs from the valve. 2. Replace.
10. During the high-speed driving, steering is too fast.	1. The valve-bar of the Oil flow-amplifying valve can't move flexibly. 2. The measuring ports at two ends of the valve bar are blocked.	1. Check, repair or replace. 2. Clean or replace valve bar.
11. Too much noise from steering pump, and steering cylinder piston moves too slow.	1. Air comes into steering system pipelines. 2. Oil viscosity of steering pump is too thin. 3. Insufficient hydraulic oil. 4. Internal leakage from steering cylinder.	1. Make a better sealing for the steering pump. 2. Check, repair or replace. 3. Fill in oil to desired level. 4. Replace sealing ring.
12. Machine driving can not be in alignment or machine swings to both sides during driving.	1. Unequal pressure of tires. 2. Load on machine inclines to one side. 3. Steering spring fails to work. 4. Dual-way overflow valve fails to work. 5. Air comes into hydraulic steering system.	1. Inflate tires to desired pressure. 2. Centralize loads upon the machine. 3. Replace. 4. Replace. 5. Check and fix it.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



(2) Hydraulic system for bucket mechanism

Trouble symptoms	Causes	Remedies
1. There is no power to raise or turn the bucket.	1. Sealing ring wears out. 2. Internal oil leakage from valve. 3. Oil leakage from oil circuit. 4. Internal oil leakage of the pump. 5. The pressure for safety valve is set too low. 6. Oil filter and suction pipe get blocked.	1. Replace. 2. Check, repair or replace. 3. Check and fix it. 4. Check, repair or replace. 5. Adjust it to desired pressure. 6. Clean or replace.
2. The main boom falls down.	1. The sealing ring for its cylinder piston is broken. 2. Internal oil leakage from the multi-way valve. 3. The check-valve of its cylinder an not stop oil.	1. Replace. 2. Check, repair or replace. 3. Check, repair or replace.
3. Too much noise.	1. Low hydraulic oil level. 2. The filter gets blocked. 3. Air comes into oil pump or suction pipeline.	1. Fill in oil to desired level. 2. Clean or replace. 3. Check and bleed out air.
4. There is vibration when raising or turning bucket.	1. Low hydraulic oil pressure. 2. Internal oil leakage from oil pump. 3. Air comes into oil pump or suction pipeline. 4. Cylinder piston gets loose. 5. The pressure for opening safety valve is unstable.	1. Fill in oil to desired level. 2. Check, repair or replace 3. Check and bleed our air. 4. Check and repair. 5. Check, repair or replace.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



Trouble symptoms	Causes	Remedies
5. Too high oil temperature	1. Too low oil level. 2. Oil quality gets dirty or deteriorated. 3. Oil radiator fails to work. 4. Long time working with machine continuously or working with overload. 5. Internal leakage from oil pump.	1. Fill in oil to desired level. 2. Replace. 3. Clean or replace. 4. Stop machine for getting it cool, and avoid working with overload. 5. Check, repair or replace.

6.3.4 Braking System

Trouble symptoms	Causes	Remedies
1. Braking force of foot braking system is not strong enough.	1. Brake liquid is insufficient. 2. Brake oil chamber has oil leakage. 3. There are some air in the brake hydraulic pipelines. 4. The pressure of compressed is too low. 5. Seal ring of boost pump wore out seriously. 6. Friction plate has been wore out to limit.	1. Fill brake liquid. 2. Replace the seal ring. 3. Exhaust the air. 4. Check the pipeline is leak air or not. 5. Replace the seal ring. 6. Replace the friction plate.
2. The parking brake could not be released properly.	1. The exhausting hole of manual brake valve is blocked. 2. The piston of brake cylinder is jammed. 3. Pressure of compressed is too low.	1. Clean it. 2. Clean or replace it. 3. Check the pipeline is leak air or not.
3. Parking braking force is not enough.	1. Spring on braking cylinder fails to work. 2. There is oil on barking discs. 3. The clearance between brake drum and brake shoe is too large.	1. Replace. 2. Clean. 3. Adjust the clearance.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



Trouble symptoms	Causes	Remedies
1. Braking force of foot braking system is not strong enough.	1. Internal leakage from oil pump. 2. Filter being blocked. 3. Air get into oil pump or its suction tube. 4. Braking valve is broken. 5. Braking discs get worn out severely.	1. Check., repair or replace. 2. Clean or replace. 3. Bleed air out. 4. Replace. 5. Replace.
2. The parking brake could not be released properly.	1. Please see the Causes 1, 2, 3 and 4 in the trouble No. 1 .	1. Please refer to the description about trouble No. 1.
3. Parking braking force is not enough.	1. Spring on braking cylinder fails to work. 2. There is oil on barking discs.	1. Replace. 2. Clean.

6.3.5 Electrical System

Trouble symptoms	Causes	Remedies
1. The generator doesn't work or voltage is low.	1. The wiring to /from generator gets loose. 2. Generator belt gets loose. 3. The regulator or generator fails to work.	1. Fasten. 2. Adjust. 3. Check, repair or replace.
2. Generator gets too hot.	1. Its bearing wears out or lacks of grease. 2. Its commutator or armature gets short.	1. Replace the bearing or apply grease. 2. Check and repair.
3. The battery can not be recharged or recharging current is too low.	1. The generator winding gets short or broken. 2. Wiring for the pole "+" of the generator falls off. 3. The battery wiring gets loose or falls off. 4. The generator belt is too loose.	1. Check and repair. 2. Fasten. 3. Fasten. 4. Make adjustment.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



Trouble symptoms	Causes	Remedies
4. Too much current and time for battery recharge.	1. The contactor of the regulator is burnt down. 2. Battery has some short-circuit breaking-circuit at some part. 3. Wiring for pole "-" of the generator falls off. 4. Poor connection for regulator wiring.	1. Replace. 2. Check, repair or replace. 3. Fasten. 4. Check or repair.
5. Starting motor often gets burnt down.	1. Key switch is not restored to original position. 2. Starting line gets short.	1. Check or repair. 2. Check or repair.
6. Lamps don't light.	1. Fuses are broken. 2. Lamps bulbs get burnt down. 3. Cable wirings fall off.	1. Replace. 2. Replace. 3. Check and repair.
7. Instrument shows wrong readings	1. Cable wirings get loose or fall off. 2. Sensors are damaged. 3. Instrument is damaged.	1. Check and repair. 2. Replace. 3. Replace.
8. No way to start the engine or very difficult to start the engine.	1. Breakdown of the battery or insufficient electricity. 2. Poor cable wiring or broken wiring. 3. Breakdown of the starting motor. 4. The gear-selector joystick is not at neutral.	1. Replace or recharge. 2. Check or repair. 3. Repair or replace. 4. Put the gear-selector joystick at neutral position.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



6.3.6 Air-conditioner system

No.	Trouble Symptoms	Causes	Remedies
1	The condenser fan doesn't turn.	1. Poor wiring connection. 2. The relay, fan regulator or temperature regulator gets damaged. 3. Poor wiring connection to the fan regulator resistance. 4. The fuse is broken or the battery voltage is too low.	Repair or replace.
2	The fan can turn well, but the cooling performance is not good.	1. Some foreign staffs are sucked in. 2. The condenser gets blocked 3. The fan blade is jammed.	Clean or make judgment.
3	The compressor doesn't work or work with much difficulty.	1. The wiring cable may be broken at some place, or with poor connection. 2. The compressor belt gets loose, falls off. 3. Wiring connection for the compressor clutch gets break.	Repair or replace electrical winding.
		4. The switch of "High and Low coolant pressure" is ON.	Too much or too little coolant.
4	Insufficient cooling volume.	1. Coolant leakage. 2. Too little coolant. 3. Too much coolant.	Fix the problem of coolant leakage. And fill in coolant with proper volume.
		4. The hot water valve is not closed, causing heating and cooling performance being equal.	Close the hot water valve.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



No.	Trouble Symptoms		Causes	Remedies
			5. The hot water valve is damaged or could not be closed, causing heating and cooling performance being equal.	Replace the hot water valve.
5	Low pressure getting a little bit higher.	There is frost on the low-pressure tube.	Valve opens too much.	Replace
			Poor connection to the valve.	Install it correctly.
			Too much coolant inside the system.	Adjust the volume of the coolant.
	The low pressure getting a little bit lower.	The reading of pressure gauge is lower the normal range.	Too little cooling addition.	Replenish cooling addition.
		The low pressure gauge sometimes shows negative pressure.	The low-pressure hose gets blocked.	Clean the hose, and get it be of vacuum and replenish with fresh cooling addition.
		Vaporizer is frozen.	Thermo-meter fails to work.	Replace.
		The inlet port of the valve gets cold.	The valve is blocked or get dirty.	Clean or replace the valve.
		The output port of the valve is not cold.	Air leakage from the valve.	Replace.
	The high pressure gets a little bit high.	The reading of the high pressure gauge is higher than its normal working range.	Air is mixed into the circulating system.	After bleeding out air, and get it be of vacuum.
		Condensing performance of the condenser is poor.	1. The condenser gets blocked. 2. The condenser doesn't turn.	1. Clean off dirt. 2. Check or replace fan.
	The low pressure gets a little bit low.	Both the high and low pressure are quite low.	Too little coolant.	Fill in coolant.
		The pressure gauge sometimes how negative pressure.	The low pressure hose gets blocked.	Clean or replace.
		Problems with air compressor.	Internal problem in the air compressor.	Replace.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



No.	Trouble Symptoms		Causes	Remedies
6	The air conditioner fails to work.		1. Air leakage from thermo control valve.	Replace.
			2. The valve is jammed.	Repair or replace.
			3. The switch malfunctions.	Repair or replace.
7		Much noise inside the air conditioner system.	1. The pressure at high-pressure end is too high, causing air compressor vibrating.	Repair.
			2. Too much coolant.	Adjust it to proper level.
			3. The coolant is too little or mixed with water, and there is noise from the valve.	Adjust it to proper level and drain out water.
	Too much noise from the air conditioner system.	Much noise outside the air conditioner system.	1. The belt gets too tense or severely worn out.	Adjust or replace.
			2. The air compressor installation gets loose, or its internal or external parts get damaged.	Fasten it or replace.
			3. The clutch slides, or lacks of oil or gets broken.	Fill in oil or replace.
			4. The support bracket of the condenser get loose or broken.	Fasten or replace.
			5. The bearing of the condenser fan is lacking of oil or getting broken.	Fill in oil or replace.
			6. The blade of the condenser fan gets broken or loose.	Get it fastened or replace.
			7. The fan blades conflict with its external hood.	Adjust or replace.
8	No warm wind in winter season		1. The hot water valve is not open, causing the hot water can not be circulating.	Open the hot water valve.

6. Troubles, Trouble Diagnosis And Trouble-Shooting Remedies



No.	Trouble Symptoms	Causes	Remedies
		2. The hot water valve is broken or could not be fully opened, leading poor circulating for the hot water.	Replace the hot water valve.

7. Maintenance



7.1 Instruction on Maintenance

In order to maintain the good performance of a wheel loader, prevent hazards happening, reduce repair cost and prolong the machine service life, it is a "must" to use machine properly, carry out periodical maintenance and make in-time trouble-shooting to the machine. So in this chapter, you will find informative description on the maintenance procedure and measures for the machine under the normal working condition. As for the maintenance practices for the key parts and working system of the machine which is used under extreme environment, please see the specific two sections: "Maintenance Instruction for Hydraulic System" and "Maintenance Instruction for Electrical System".

7.1.1 Maintenance Instruction for Hydraulic System

The often-seen problems that happen in the hydraulic system of the wheel loader are usually caused due to the contamination (foreign material) in the hydraulic return-loop. Therefore, special care must be paid to keep the fine cleanness of the hydraulic units during replenishing hydraulic oil or dismantling/installing hydraulic units.

(1) Working Environment

To avoid refilling hydraulic oil, replacing hydraulic filters and repairing the machine in an area with raining, strong wind or much dust.

(2) When dismantling or serving the machine outdoor

If you dismantle or serve a wheel loader outdoor, then there will be risk of having foreign dirt penetrating into the working system of the machine. So, only simple maintenance work can be executed outdoor, such as: parts replacement. While, to dismantle or to serve the hydraulic system of a machine should be done in a special repair-shop, where it is very clean, without dust, and there are special testing devices available to make it possible to test the machine performance after such maintenance work finished.

(3) Get the Open-Ports Sealed

After dismantling a hydraulic unit or hose, bear it in mind to keep all the open ports be well sealed with blocking plugs or other plastic staffs, so as to prevent foreign material or dust getting into those open-ports. It is not allowed to leave those ports open or seal them with only dirty cloth, as such way of doings will easily get the hydraulic parts be polluted with foreign material penetrating into them or get the working area be polluted with oil leakage. In addition, don't reject the drained oil onto the ground anywhere. What you should do is to collect the drained oil and treat it properly and environment-friendly.

(4) Never Let Any Foreign Material or Dust penetrate into Hydraulic System During Replenish Fresh Oil

During the process of replenishing fresh oil, care should be given not to let any foreign material or dust penetrate into the hydraulic system. Make sure the oil-filling port and its surrounding area are very clean, without any pollution. Also, please use the clean pump and oil container. If an oil-filtering device is available, it will be better to keep the oil more clean, as the oil-filtering device could filter off any dirt that is built-up during the oil storage (Please see Fig. 07-01).

(5) Replace Hydraulic Oil While It Is Still Hot

It is better to replace the hydraulic oil when the oil is still hot, as the hot hydraulic oil could flow much easier, so any built-up debris can also flow out together with the hot oil-flow. When making oil replacement, try best to drain off all the remaining used oil (draining off the oil not only in hydraulic tank but also in the oil hoses or plugs). If there is any remaining used-oil, then it will get mixed with the fresh oil, which will shorten the service life for the newly-refilled oil.

(6) Flushing Hydraulic System

After dismounting or installing the hydraulic system or when making oil replacement, it needs to flush, with cleaning oil, the hydraulic loops to get rid of the built-up debris, dirt and remains in the oil circuits. Normally, apply two times flushing: for the first time, use the special cleaning oil; and for the second time, use the fresh hydraulic oil for flushing (Please see Fig. 07-02).

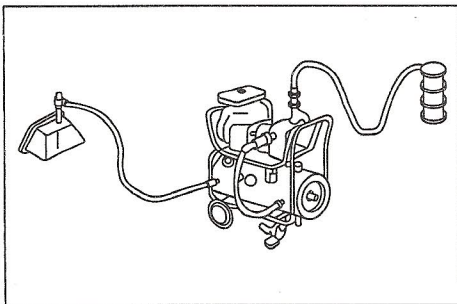


Fig. 07-01

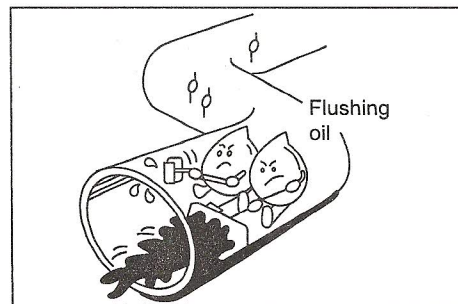


Fig. 07-02

(7) Clean Hydraulic Units

After carrying out maintenance work on the machine hydraulic system (oil pumps and control valves), or when the machine is still running, clean the hydraulic units with a kind of cleaning-device to get rid of the debris and remains inside the hydraulic loop. This cleaning-device can get rid of the very fine partials (with size of $3\mu\text{m}$) that could not be filtered out only through the filter in the hydraulic system, so such way of cleaning oil is very helpful and effective (Please see Fig. 07-03).

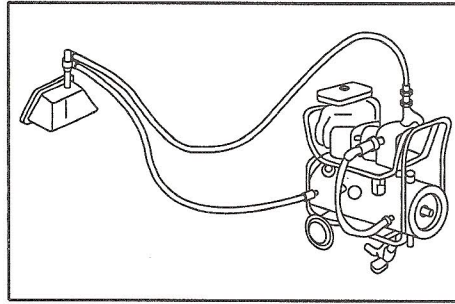


Fig. 07-03

7.1.2 Maintenance Instruction for Electrical System

(1) Handling Harness And Plug

The electric harness includes the electric cables, electric plugs and electric protectors.

△ As everybody knows that most of electric harnesses are exposed directly to water, heating, raining and shocks, if comparing them with the cables that are fixed inside the battery or control panel. Furthermore, during the maintenance and checking process, the harness will be dismantled and re-installed frequently, so they will easily get deformed or damaged. Therefore, special care should be given during handling the electric harness (See Fig. 07-04).

Main Problems of Electric Harness

1) Poor connection of electric plugs (poor connection between plugs and sockets).

The main reasons for such problem are: The plug is not well positioned into socket; or socket terminal is deformed; or the plug and socket are not in alignment; or the contactor of the plug get rusty or oxidized, etc (Please see Fig. 07-05).

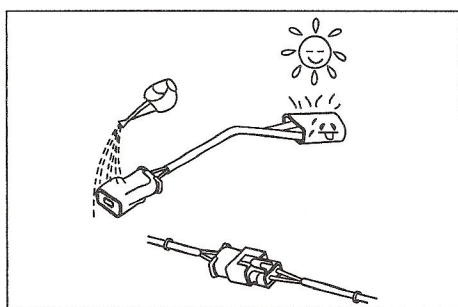


Fig. 07-04

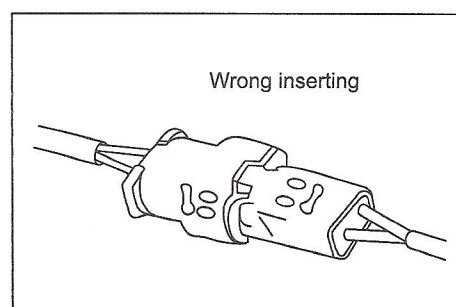


Fig. 07-05

2) Poor connection or welding defect

The contactors of the plugs or sockets are electrically connected when they being connected to the terminals cables. If you apply too much heavy force on the electrical cables, then the surface coating on the cables will be tore off, which will cause poor connection or just disconnection (Please see Fig. 07-06).

3) Cables connection break-off

When you pull out the plug while you are holding the cables, maybe due to the conflict between the cables and other machine parts, the contactor of the plug will possibly break off or be damaged at its welded section, or the cables get damaged, which will lead the cables connection break-off (Please see Fig. 07-07).

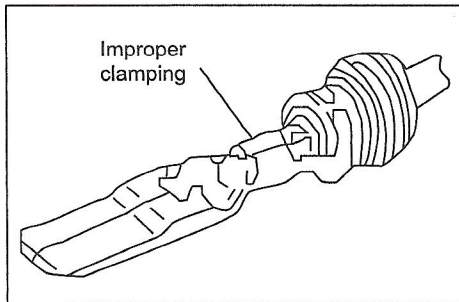


Fig. 07-06

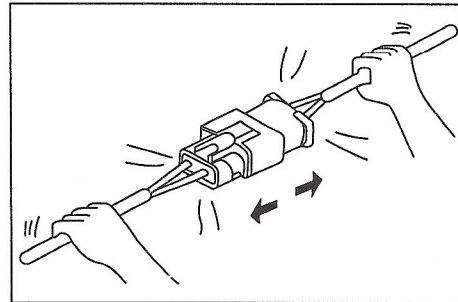


Fig. 07-07

4) High-pressurized water penetrating electric plugs

Please use the plugs that are of water-proof. But in case the pressurized water is directly sprayed onto the plugs, the water could still possibly enter into the plugs.

If so, the water will have the electric connection be short, therefore, as long as water gets into plugs, dry the plug immediately, and take other measure before it is electrically connected (Please see Fig. 07-08).

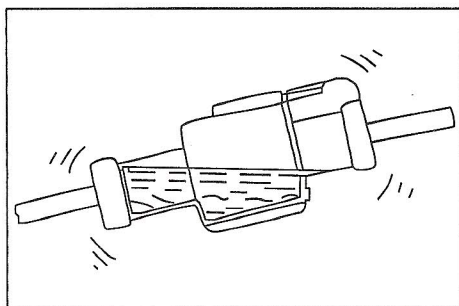


Fig. 07-08

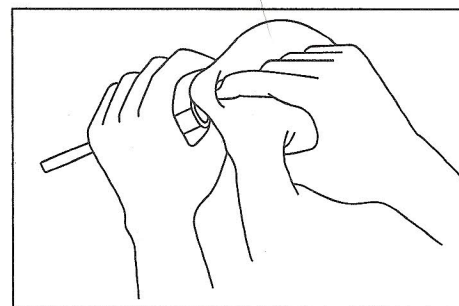


Fig. 07-09

5) Plug being polluted with oil or oily dirt

In case the plug gets polluted with oil or oily dirt, that will lead poor contact between the plug and the socket, which will affect the electric current flow.

If so, clean the plug with a piece of clean cloth, and get it dry with compressed air (See Fig. 07-09).

△ When inserting plugs into sockets, take care not to apply too heavy force, otherwise you will get the contact deformed.

△ When drying a plug with the compressed air, which contains water or oil, then it will get the plug more dirty. So be sure to drain off completely water or oil in the compressed air.

7. Maintenance



(2) Separate, Connect And Dry Plugs or Harness

- 1) When you need to separate a plug from a cable, you must hold the plug itself instead of the cable. As for the plug which is pressed with bolts, then you need unfasten the bolts completely, afterwards, hold the plug and socket with hand and separate them off. As for the plug with safety-lock, then firstly you should release the safety-lock with your thumb, and then get them off again.

△ Never try to separate a plug with only one hand (Please see Fig. 07-10).

- 2) Pull out a plug from bracket plate (See Fig. 07-11).

In case of pulling out a plug from a bracket plate, pull it out in the direction parallel to the plate.

△ If you turn the plug up and down or to both left and right sides, you could possibly have the plug hood damaged.

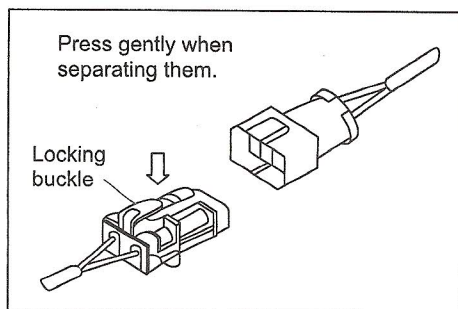


Fig. 07-10

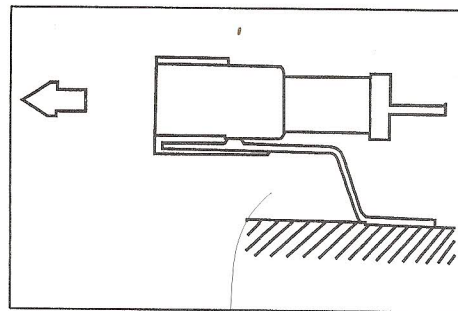


Fig. 07-11

3) Measures to be taken after a plug being removed

After a plug being removed from its socket, then wrap it with a plastic bag, so as to prevent dust, dirt, oil or water penetrating into the plug and the socket (Please see Fig. 07-12).

△ Plugs and sockets must be given good protection after a machine has been disassembled, otherwise it will cause poor electric connection.

To Connect a Plug

1) Inspect plugs visibly

- ① Check if there is any oil, oily dirt or water on the plug and the socket.
- ② Check if the plug and the socket get deformed, rusty or damaged, which will lead poor connection.
- ③ Check if the plug and the socket still maintain proper appearance, without cracking and damage.

△ If the plug is contaminated with oil, water and oily dirt, then clean it with a piece of clear cloth. If there is any water coming into the plug, then get it dry or heat its cable a while, but be care not to get it overheated, otherwise, it will cause a problem of short-connection.

△ If finding there is any plug damaged or cracked, then replace it with a new one.

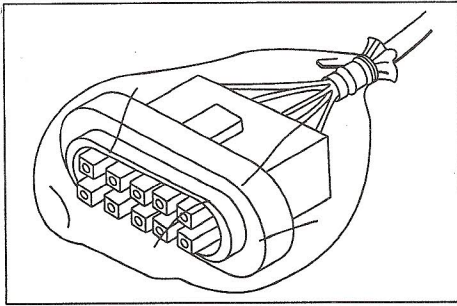


Fig. 07-12

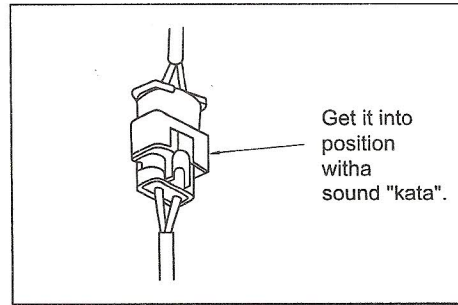


Fig. 07-13

2) Securely fasten the plug

Insert securely the plug into its socket, it will be all right. When inserting a plug with the protection locking device, then push the plug slowly into the socket, and it will be well positioned when you hear " Clicking" sound (Please see Fig. 07-13).

3) Adjust the position of plug case and the harness installation. For the plug with a cable-guiding case, pay attention to direction when inserting the plug. In addition, if the harness is not properly installed or its clamping clips are wrongly positioned, then adjust the installation position of the harness.

△ If it is difficult to adjust the plug, then you need to remove off its clamping clips to adjust it to proper position.

4) Be sure to refix the clamping clips again after finishing adjustment for the plug installation position. Check if all the clips are strongly fixed.

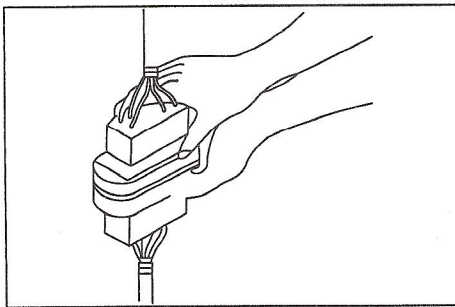


Fig. 07-14

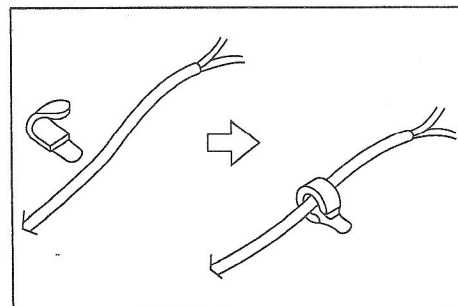


Fig. 07-15

To Dry Harness

If finding the harness is polluted with oil or oily dirt, then clean it with a piece of clear cloth. Avoid washing it in water or flushing it with steam. If you have to wash it in water, then don't attempt to wash it with high pressure or flush it directly with water steam.

In case water is directly sprayed onto a plug, take the following measures:

1) Disassemble the plug and clean it with a piece of dry cloth (Please see Fig. 07-16).

7. Maintenance



△ If you want to dry the plug with compressed air, make sure the compressed air is free of oil, otherwise it will cause the risk of poor connection.

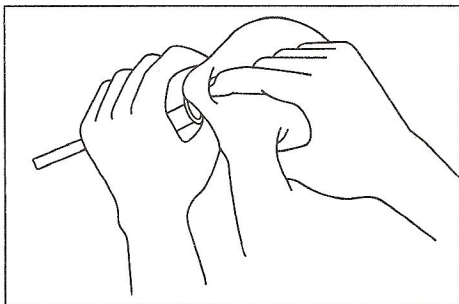


Fig. 07-16

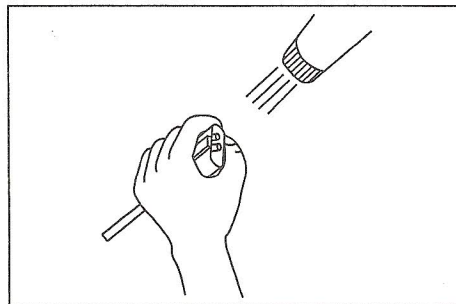


Fig. 07-17

2) Dry the inner side with a dryer (See Fig. 07-17).

If water penetrates into inner parts of the plug, then definitely dry it with a dryer.

△ Be care not to dry the plug with a dryer for too long time. This is for preventing the plug from getting too overheated, which, otherwise, will have the plug be out of shape or be damaged.

3) Test to see if the plug is still of good electrical connection

After the plug being dried, check if the plug and the harness are still of good electrical connection, without being short or disconnection (See Fig. 07-18).

△ After getting the plug completely dry, re-fix it on and make sure it is of good electrical connection.

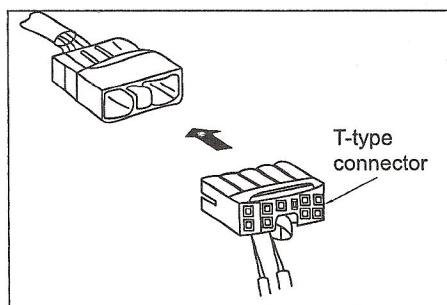


Fig. 07-18

(3) Precaution for Electric System Maintenance

1) Prior to releasing or disconnecting a electric plug, be sure to switch off the main power.

2) Before carrying out any trouble-shooting, check other relative electric plugs.

△ When releasing or disconnecting the plugs, double-checking is required for being sure.

3) Also make sure to re-connect the plugs that have been removed off before making the next checking and repairing.

7. Maintenance



- △ Don't get the plug electrically connected while it is in the status of being released from its socket.
- 4) When making trouble-shooting to the electrical problem, check the current, voltage, resistance and main power of the electrical system, and double-check the plugs and sockets, and check if the test-gauge shows the fluctuating readings.
- △ If the test-gauge does show the fluctuating readings, then it means that there is something wrong in the electrical line, which will cause the poor connection.

(4) Precaution for Controls Panel Maintenance

- 1) In the controls panel are the warning lamps, fuses, computer controller for ZF gearbox, relays and other key electrical units and cables, so when giving maintenance or check to the controls panel, special care should be given to gently handle the electrical lines.
- 2) Unless it is necessary, otherwise, don't open the cover of the controls panel.
- 3) Don't put tool-kits onto the controls panel.
- 4) Never touch the plugs or sockets only with hands. Cover them with adhesive tapes or plastic bags.
- 5) Don't keep the cab door open in the raining days, so as to prevent controls panel from being exposed to raining.
- 6) Don't place the heating source, oil and water near the controls panel.
- 7) Precaution to be followed during making arc welding: when it is necessary to do arc welding on the controls panel, be sure to take off all the harness and plugs that are connected to the controls panel, and also have the arc welding device be grounded.

(5) Maintenance for Fuses

- △ Prior to replacing a fuse, be sure to get the main power switch off.

The fuses function as protecting electrical components and cables from being burnt, so if finding there is any fuse getting damaged or loose, replace it immediately with a new one with same capacity.

7.2 Maintenance And Service to the Machine

7.2.1 Main Measures for Reducing Machine Breakdown

7.2.1.1 Strengthening Maintenance During Running-in Period

Running-in period refers to the initial machine driving period, during which the machine parts change a little physically in terms of their geometrical shape and mechanical performance. Normally speaking, the initial driving time (about 50 hours) is called running-in period.

By observing the status of machine parts wearing, you can judge that the running-in period is just the time that the machine parts get wearing most. Therefore, during the running-in period, special attention should be paid to the machine maintenance and service. Bear it in mind that during the running-in period, the



machine should be only loaded with 70% of its rated loading capacity, while adjusting the clearance between machine parts, fastening the bolts and screws, applying grease, replacing lubricating oil and hydraulic oil at any time.

7.2.1.2 Reasonably Arrange Machine Work Agenda And Loading Burden

Loading burden and working time of a wheel loader are the two key factors affecting the machine service life. If a wheel loader is much frequently operated with overloads, it will not only speed up the machine parts wearing but also damage the machine engine, gearbox and torque converter due to those components getting over-heated. While if a machine is kept working long time, it will easily get the machine operator fatigue, which will cause wrong-doing operation, leading the risk of possible hazards. Therefore, according to practical work situation, to reasonably arrange work agenda and avoid long-time working with overload for the machine is a critical measurement for prolong the machine service life.

7.2.1.3 Improve Operator Qualification

Provide the machine operators with training on "know-how" of the machine operation and maintenance & service, so that the operators could handle the problems possibly arising from using the machine.

7.2.1.4 Strengthening Technical Management

According to actual work requirement for a wheel loader, draw out operation rules, plans and regulation on how to use, check, repair and serve the machine, so as to enhance good maintenance for the machine and maintain it in good technical status, through which to improve the machine performance and prolong its service life. This manual is just one that is outline according to many tests and customers comments, which lists the general standards and practice for the machine maintenance, so it is very helpful to the machine operators when they use and serve the machine.

7.2.2 Daily Checks And Periodical Maintenance

(1) Daily Checks

The daily check routine include the followings:

- 1) Engine and electrical instruments
 - a. Check the water level in the engine water tank;
 - b. Check the oil level in the engine oil-pan and also check the engine oil status.
 - c. Check fuel level in fuel tank.
 - d. Check if there is any leakage from oil tubes, water hoses, pneumatic hoses or fittings.
 - e. Check to see if the electrical cables are well connected, especially check the cables connection to the battery.

7. Maintenance



2) Machine chassis

- a. Check the hydraulic oil level.
- b. Check if all the tubes (pipes) and hydraulic units of the hydraulic system are well sealed.
- c. Check the oil level in gearbox oil-pan.
- d. Check if the foot brake and hand brake function properly.
- e. Check if all the control joysticks can be moved flexibly and be placed at their neutral positions.
- f. Check the tires pressure.
- g. Check the mounting screws on the rims, axles and transmission shaft, etc.

3) Checks to be executed after the machine engine being started

- a. Check if all the instruments can work properly.
- b. Check if all the illumination lamps, signal lamps, instruments, horn, wiper and water sprinkler can function properly.
- c. Check if all the working mechanisms can work properly.
- d. Check the gear selector to see the machine can drive as desired.

(2) Periodical Maintenance

Periodical maintenance for a wheel loader is classified as: 50, 100, 250, 500, 1000 and 2000 working hours specifically.

1) Maintenance for every 50 working hours

- a. Fasten the mounting bolts on the transmission shaft.
- b. Check the accelerator control handle, hand brake and gear-shifting mechanism.
- c. Apply grease to the fan, articulated joints, transmission shaft and rear axle supports
- d. Fuel tank: Unscrew the oil-drainage plug at the bottom of the fuel tank, and drain off sediments and water.

2) Maintenance for every 100 working hours (at the same time, do maintenance jobs for every 50 hours)

Only after the machine being operated for the initial 100 hours can the following maintenance jobs be done: to replace the oil and filter of gearbox.

- a. Check if all the mounting screws on the hubs are properly fastened.
- b. Check the oil level in both front and rear axles.
- c. Apply grease to the articulated joint at the rear axle.
- d. Clean the air filter.
- e. Check the tires pressure.
- f. Check the engine oil. If necessary, replenish with fresh oil.
- g. Check the belt tension of the air-conditioner compressor.
- H. Lubricating: Apply grease to the pins on the bucket, bucket link-bar, swinging arm, cylinder and boom.

7. Maintenance



3) Maintenance for every 250 working hours (at the same time, do the maintenance jobs for every 50 and 100 working hours)

Only after the first 250 working hours can the following maintenance jobs be done: to replace the fuel filter core, to replace the gear-box filter core, and to check and adjust the engine throttle.

- a. Clean the engine filter, and replace the filter core if necessary.
- b. Clean the oil-pan and the filter core of the gear-box.
- c. Clean the oil tanks (or oil-pans) for engine oil, fuel, gearbox oil, hydraulic oil and their filter as well.
- d. Check if there is any cracking loosening parts on the working mechanism, front and rear axles and the rear axle support. And fasten the mounting screws on the hubs.
- e. Check the wearing status of the parking brake.
- f. Check the belts tension of the engine fan and generator belt. If necessary, adjust them.

4) Maintenance for every 500 working hours (at the same time, do the maintenance jobs for every 50, 100 and 250 working hours)

- a. Replace the gearbox oil, and clean the oil-pan and the filter of the gearbox.
- b. Fasten the mounting bolts on the machine frame, particularly on the articulated joints. And fasten the screws on the rear axle support.
- c. Check and adjust the clearance for the hand brake.
- d. Replace the engine oil.

5) Maintenance for every 1000 working hours (at the same time, do the maintenance jobs for every 50, 100, 250 and 500 working hours)

- a. Replace the gear oil in both front and rear axles.
- b. Replace the hydraulic oil, and clean the filter of the hydraulic oil tank; and clean ventilation ports of the gearbox and torque converter.
- c. Replace the braking oil, and raise the machine frame and turn the machine tires to check the machine braking performance.
- d. Clean the engine's oil-pan, engine oil tank and its filter. And replace the engine oil and diesel oil.
- e. Adjust the clearance between the turbo-supercharger blades, and fasten the mounting bolts and screws on the turbo-supercharger.

6) Maintenance for every 2000 working hours (at the same time, do the maintenance jobs for every 50, 100, 250, 500 and 1000 working hours)

- a. Make maintenance to the engine according to what is stated in the specific engine manual.
- b. Check and serve the gearbox and torque converter (please refer to the specific manual of the gearbox).
- c. Disassemble and check the differentials of both front and rear axles and hub reducer.
- d. Disassemble the steering system and calibrate steering angle.
- e. Check the sealing status of valves and cylinders by observing cylinder pistons lowering-down.

7. Maintenance



And measure the pressure of hydraulic system. If volume of the cylinder lowering down is one time of the rated value, then you need to disassembly and check the cylinder and valves.

- f. Check if there is any cracking or damage on the welded areas of bucket and machine frame. And also check if all the mounting bolts are securely fastened.
- g. Check the rim and hub to see if they get out-shaped due to unbalanced loading.

7.3 Maintenance for Key Working System

7.3.1 Maintenance for Transmission System

Engine

(1) Maintenance for engine

Correct and proper maintenance to the engine will help prolong a machine's service life, improve its operation performance more economically.

- 1) Please check the followings for a new engine or an engine without being used for long time:
 - a. Check if there is any leakage in the cooling system, and fill it full with fresh cooling liquid.
 - b. Check the engine oil level, and at the same time observe if there is any water or diesel oil inside the engine oil.
 - c. Check if the all the fittings of air take-in system of the engine are well fastened to prevent air leakage or dust penetration.
 - d. Operate the oil pump manually to bleed out air from the oil loop.
 - e. By using a starter, have the engine run idle for at least more than ten turns.

2) Engine starting

- a. Everyday, before starting the engine, be sure to check the coolant level, engine oil level and drain off the condensed water from the oil-water separator.
- b. Check all the belts tension.
- c. Once the engine being started, turn the key switch, so as to separate the starter and the engine.
- d. The time for starting the engine each time should be less than 10 seconds. And if the engine could not be started successfully in only one time, then wait at least one minute before you attempting to re-start it again.
- e. Immediately after the engine being started, observe the readings of engine oil pressure gauge. (Normally, pressure should not be less than 69KPa while the engine runs at idle speed; and pressure not less than 207KPa while the engine at 2000r/min). And check if the starter is still running.
- f. Let the engine run at idle speed for 2-3 minutes. And then operate slightly the accelerator control handle to increase the engine speed to 1500-1700r/min for warming-up the engine.

7. Maintenance



3) Engine Engagement

- a. The initial running time of 30 hours (or 1000km) is the running-in time of an engine.
- b. Before having the machine be loaded, let the engine be completely warmed up. Only after the coolant temperature is up to 40°C can you have the engine be loaded.
- c. Don't keep the engine running at idle speed or with full rated load for more than 5 minutes.
- d. To change the engine rotation speed or the load burden on it is helpful to the engine engagement during its running-in period.
- e. It is strictly prohibited to let the engine slide while its engine being shut off, otherwise it will burn down the engine turbo-supercharger.
- f. In case the engine water temperature is over 99°C, then stop the machine immediately and check it. It is not allowed to still drive the machine with the thermo-meter being dismounted.

3) Requirement for fuel, oil and coolant

- a. Use different types of fuel according to ambient temperature (See Fig. 03-04).
- b. Drain off water from the oil-water separator, and replace the fuel filter periodically as required.
- c. Use different types of engine oil according to the ambient temperature (Please see Fig. 03-04).
- d. Use different types of the coolant according to different ambient temperature: normally if the ambient temperature is over -37°C, then the engine coolant can be the mixture of 50% water + 50% ethanediol.

Maintenance for Engine Cooling System

- a. Before starting the engine, firstly check the water level inside the water tank. If necessary, refill with water for ensuring there is enough water for the cooling system. Special care should also be paid: when finding the engine water boiling due to insufficient water, don't fill cold water immediately, otherwise it will cause the engine parts to be cracked due to " sudden cooling". The proper way to handle this situation is to release the engine load firstly, and get the engine speed slow down till it gradually stops. After the engine temperature cools down, refill water again. If finding the water level lowers down very fast, it shows that there is leakage in the engine cooling system, then you should check the engine, figure out the problem and get rid of it.
- b. During the engine running, keep close watch at the water temperature. Normally after the temperature goes up to 70°C can the engine be loaded. While if the water temperature is over 95°C, then you need to decrease the engine load. Unless it is the reason of over-loading on the engine that causes the machine engine getting over-heated, then stop the machine and figure out the reason and get the problem solved before you attempt to restart the engine again.
- c. Apply grease to the water pump periodically, and check the tension of the fan belt. If necessary, adjust the belt tension.
- d. Check the thermo-meter periodically to ensure it works well. During machine operation, it is not allowed to dismount the thermo-meter, otherwise it will severely reduce the engine economy and shorten its service life.

7. Maintenance



- e. Periodically clean off incrustation built-up inside the cooling system, so as to ensure the proper cooling performance.
- f. In case the machine works under the extremely cold ambient temperature, then after the machine stops, drain off completely water from water tank, water cooler and water pump, so as to prevent engine case or its parts from being cracked due to frozen water (except the case of anti-freezing addition being adopted.). When you need to start the engine again, refill with hot water (cooling liquid). Never firstly start the engine prior to adding cooling water.

Maintenance for engine oil (fuel) pump system

- a. Use different type of fuel according to different ambient temperature. When filling with fresh fuel, make sure the fuel tank is clean. And periodically clean or replace the fuel filter core.
- b. Check often the tubes and fittings of the fuel system to see if they are well sealed. Avoid air penetrating into fuel system, which, otherwise, will interrupt the fuel flow and affect the engine performance.
- c. The fuel injection piston and injection nozzle of the engine are of dedicate parts, which could not be inter-changed. Therefore, replace them always together. And if it needs to adjust them, then adjust them on a specific testing table. And also, please use the special tool when dismounting them. When the fuel pump is found with problem, it is required to have experienced service people to repair and adjust it on a testing table. Never blindly adjust and repair the fuel pump. Bear it in mind that improper adjustment and repair will bring great damage to the engine and even cause severe accident.
- d. As regarding the adjustment for the fuel injection interval, please refer to the specific Engine Manual. And such adjustment should also be carried out by a qualified and experienced service people.

Maintenance for turbo-supercharger

- (1) The turbo supercharger normally works under the high temperature with high speed, so following maintenance should be made during the process of using it:
 - a. As the turbo-charger works under about 500°C temperature, so the engine system must be maintained at good lubrication and easy going-through on all its pipelines and tubes. Therefore, maintenance for the turbo-supercharger must be done strictly according to maintenance rules. And replace the engine oil and its filter every 250 working hours to ensure the clearness of engine oil.
 - b. Check frequently the sealing status of the engine's air take-in system. And prevent any foreign staff entering into the turbo-supercharger or air ventilating system.
 - c. Make sure the pipelines from the air filter and air take-in tube as well as from the turbo-supercharger to exhaust emission tube are well positioned and securely sealed.
 - d. For a new turbo-supercharger and an old one which has not been used for long time, as well as after a turbo-supercharger being disassembled and cleaned, firstly unfasten the oil-inlet connector and fill in enough oil, so as to prevent the turbo-supercharger being burnt due to lacking of oil when the engine being started.

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(2) Maintenance for ZF gearbox

1) Key statement

- a. When checking the oil level in the gearbox, the engine speed should be at its idle speed (about 1000r/min), and oil temperature is within its normal working temperature. When the oil temperature is 40°C, the oil level should lie between the middle scale and lower scale of the oil-dipstick; while when the oil temperature is up to 80°C, the oil level should be between the middle scale and upper scale of the oil-dipstick.

△ After the engine stops running, the oil level inside the gearbox will basically go up. How much the oil level will go up is related with the gearbox installation!

- b. Strictly according to the maintenance requirement, replace periodically the gearbox oil and its oil filter.
- c. Every time, before starting the engine, be sure to keep the gear-selector be in neutral position.
- d. Before starting to drive the machine, disengage the parking brake.
- e. During separating the engine and gearbox away, if it needs to hoisting the gearbox, care should be taken not to have the torque converter fall down.
- f. When it needs to stop a machine, it is required to move the gear-selector joystick to the neutral position.
- g. Before leaving the machine be unattended, block the machine tires with wedges for the sake of safety.
- h. When towing a machine, it is not allowed to have the towing speed of more than 10km/h with towing distance over 10Km.
- i. It is acceptable if the oil temperature goes up to 120°C from its normal working temperature range of 80~110°C in case the machine is loaded heavily.
- j. Keep a close watch to the oil pressure of the gearbox. During machine operation, if the gearbox is found with any abnormal phenomena, then stop the machine and check it immediately.

△ When the machine is found with trouble and needs to be welded during repairing, bear it in mind to remove off the electric plug of EST (a computer controller attached to the gearbox) for shut off the electrical connection to EST. Otherwise, the EST computer will be possibly damaged due to the electrical shock during welding.

● Maintenance And Service

- a. Oil liquid: Please adopt the oil liquid as recommended in the specific Gearbox Manual or in " Wheel Loader Operation Manual, which is suitably used on 4 WG-200 gearbox.
- b. Check oil level (once every week).

- Park the machine onto a flat area, and place the gear-selector at neutral position "N". Let the temperature of the gearbox be at its normal working temperature range, and let the engine run at idle speed of about 1000r/min. Unscrew out, anti-clockwise, the oil-dipstick, and take it out and clean it. Insert the oil-dipstick into oil tube, and fasten it. Then take it out again. (at least 2 times). 1 When the gearbox

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temperature is 40°C, the oil level is located between the scale "Cold" and the middle scale of the oil-dipstick. When the gearbox temperature is 80°C, the oil level is located between the scale "Hot" and the middle scale of the oil-dipstick. To check the oil level before the machine is started can only ensure to have enough oil for oil circulation inside the gearbox and the torque converter. The final standard for determining the oil level for the gearbox is the level that you measure when the machine is warmed up and operated.

c. Replace and refill oil

△ After the first 100 working hours of the machine, replace the machine oil for the first time. Afterwards, every 1000 working hours or at least every year, replace oil for the machine at least once time.

When replacing the machine oil, note the following points:

- Park the machine onto a flat area, take out the oil-drainage plug and sealing ring while the gearbox temperature is still within its working temperature range, then empty oil out.

△ When draining oil, you not only need to empty the oil out gearbox but also need to empty oil out the torque converter and radiator.

- Clean the area around the oil-drainage plug and sealing area, then fix the new sealing ring.
- Fill with the oil as recommended in ZF manual.
- Move the gear-selector to neutral position "N", and then start the machine and let it run at idle speed.
- Fill in oil till oil level goes up to the upper scale of "Cold" scale area as shown in the oil-dipstick.
- Operate the gear-selector to all the gear positions for one time, and then park the machine at a safe place.
- Re-check the oil level again. If necessary, refill the oil once again.
- When the gearbox temperature is 40°C, the oil level is located between the scale "Cold" and the middle scale of the oil-dipstick. When the gearbox temperature is 80°C, the oil level is located between the scale "Hot" and the middle scale of the oil-dipstick.

d. Replace oil filter

Every time you replace the gearbox oil, be sure to replace the oil filter (ZF fine filter). Much care should be given when installing, handling and storing the oil filter. Never use the damaged or rejected oil filter!

When installing an oil filter, take the following steps:

Coat the sealing ring with a layer of oil, insert the oil filter till it touches the sealing end of gearbox, then turn it, by hand, about 1/3-1/2 turn. Start the engine and check the oil level according to the above-mentioned steps, and check if the oil filter is tightly fastened. If necessary, turn it a little bit with hand.

(3) Maintenance for transmission shaft assembly

During driving and working with a wheel loader, the transmission shaft will bear heavy torque and loading and also be shocked due to vibration. As the transmission shaft is located at the bottom of the machine,

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working under the tough condition, which makes it quite hard to give maintenance on it, so careful and serious maintenance must be well executed to it to make sure its reliable performance. During the maintenance process for transmission shaft, please alert the following points:

- ① As the universal joint is featured in un-equal speed transmission, it could have the transmission shaft and its parts produce twisting vibration, which will affect negatively the service life of the transmission part. In order to eliminate such twisting vibration and prevent the gearbox and the driving axles from being shocked, when installing transmission assembly, try to keep the universal joints at both ends of transmission shaft be in same level. At the same time, in order to make it easy to apply grease, it is not allowed to get the universal joints be installed in opposite direction. Bear it in mind that the oil-pan must be facing towards the transmission shaft and be in alignment.
- ② Before a transmission shaft ex-works, its manufacturer has already given it balance test and also made marks on the shaft itself and its universal joints, so during assembly and maintenance, care should be given to try to keep its relative position unchanged, and don't damage its balance. During the process of maintenance and repairing, generally speaking, it is not allowed to jointly install a transmission which is already damaged together with another one. If so, balance testing must be made. Otherwise replace the transmission shaft assembly.
- ③ Check often the mounting bolts and screws on both ends of the transmission shaft. If necessary, get them more fastened. Try to prevent the transmission shaft assembly being damaged or even severe hazards happening due to screws and bolts getting loose
- ④ When the spline shaft operating, it slides axially frequently inside its sleeve. And what is more is the cross-shaft is just the key transmission part running with heavy load and high speed. Therefore, periodical maintenance to each parts of the transmission assembly must be done as required. As the transmission shaft works under the tough condition, so, there should be oil sealing and dust-proof cover at the connection area of the splines and its sleeve, so as to prevent lubricating grease flowing out and prevent moisture and dust penetrating into.

7.3.2 Maintenance for Hydraulic System

The hydraulic system is a key component of a wheel loader, so if there is a little problem in the hydraulic system, then it will also affect the machine driving and working performance. So regular maintenance to the hydraulic system will not only improve the system reliability, avoid the machine premature breakdown and prolong the machine service life but also save the cost for machine service and repairing.

The maintenance for the hydraulic system consists of three points: daily checks, scheduled checks and random checks for hydraulic system.

(1) Daily Checks

- a. Check the oil level inside the hydraulic oil tank.
- b. Check to see if the hydraulic oil temperature is normal or not. Avoid operating machine while its hydraulic oil temperature is too high.
- c. Check if there is any oil leakage from the hydraulic fittings.

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- d. Check if the pipelines of hydraulic system get out-shape or damaged.
- e. Check if the mounting bolts and screws on the pumps and valves get loose or fall away.
- f. Check to see if the hydraulic filter gets blocked.
- g. Check the pump temperature status and check if there is any abnormal sound.
- h. Check if the hydraulic system has been bleed out air.
- i. Attention should be given not to do wrong operation to the instruments panel.

(2) Scheduled Checks

Scope of the scheduled checks goes as following:

- Periodical fastening: Bear it in mind that the mounting bolts, screws and connection fittings will get loose due to vibration or shocks during the machine operation, so periodical fastening should be done to get them fastened. When re-fastening them, care is required not to turn them wrongly with too much torque, otherwise, it will damage the threads, which will result cracking or breaking of those mounting bolts or nuts.
- Replace the sealing rings: Periodically replace and repair the sealing rings and units which have been worn out, torn or broken, so as to prevent oil leakage from the hydraulic system, improve machine productivity and prolong the machine service life.
- Periodically clean or replace hydraulic components: During the operation of hydraulic system, its pumps, valves or cylinders could produce some metal partials and be worn out in the process of their running process, which, being as a result, will affect the system operation, so it is necessary to clean or replace periodically the hydraulic components.
- Clean or replace periodically the filter core Check regularly the hydraulic filter indicator and give it maintenance periodically. Avoid the filter being blocked, otherwise the filter core will be out-shaped or even damaged and deteriorating its filtering performance.
- Clean the hydraulic oil tank When replacing the hydraulic oil, be sure to clean the oil tank, getting rid of any debris out the tank. Otherwise, if there is any foreign debris penetrating into the hydraulic system, it will bring severe damage to the system. Normally, clean the tank about every 4-6 months or being subject to oil replacement intervals.
- Clean the oil pipelines Any oil remains or foreign debris could be built-up at the elbows of the oil pipelines, which, if so, will affect the oil flow on one hand; and on the other hand, will result the system result. Therefore, you need to dismount the oil pipelines for cleaning them as scheduled.
- Periodically filter or replace the hydraulic oil Get the hydraulic oil be filtered periodically and maintain its clearness. And replace hydraulic oil as scheduled.

(3) Random checks

Carry out random checks to the hydraulic system by means of "listening, watching and testing", with main checking scopes as followings:

7. Maintenance



- a. Observe the hydraulic system to see if there is any oil leakage from its valves, cylinders and connection fittings.
- b. Check if the cylinders could work properly during they moving.
- c. During the hydraulic pumps working, check if there is any ab-normal sound from the system.
- d. Check if the hydraulic pressure at each pressure measuring points is within the acceptable range, and check if the pressure is stable or not.
- e. Check if the hydraulic system vibrates frequently during it working.
- f. Check the hydraulic temperature.
- g. Check if there is any abnormal phenomena when the hydraulic system working manually or automatically.
- h. Check the oil level to see if the level is located at acceptable scales.
- i. Check to see if the F/R shifting valve can work properly.
- j. Take the oil sample from the oil tank and test the oil quality in the hydraulic oil tank.
- k. Check if the energy-reservoir can work properly.
- l. Periodically check if all the mounting bolts, screws, connection fittings and nuts are well fastened.

In addition, special care should also be paid during the maintenance for the hydraulic system: Particularly, only the professional and qualified service people is allowed to execute the maintenance for the safety overflow valves and adjustment valves. And when dismantling a hydraulic component, make sure the working space is clean. And when re-installing the component again, check its sealing rings, and if necessary, replace it with a new one. Bear it in mind that during assembling/disassembling the hydraulic units, take care not to knock or beat the parts with heavy force, otherwise, you will break the parts.

7.3.3 Maintenance for Operation Mechanism

- 1) It is not allowed to have the wheel loader working beyond its loading capacity. If a wheel loader often works with over loads, it will speed up wearing of its shaft pins and bearings and even have the working parts be cracked or out-shaped.
- 2) Apply grease or lubricating oil to the joint-pins or shafts of the working mechanism to ensure it can work properly and prolong its service life.
- 3) Please adopt buckets according to the its specific application or working condition. And fasten often the mounting bolts on the bucket and its wearing plate.

7.3.4 Maintenance for Electrical System

- 1) Maintenance for electrical starter
 - a. Make regular checks to see if the wirings connections between the starter and battery and the main power switch are well fastened. And check if the wirings are well insulated.
 - b. The starter is designed for short-time working with much electric current, so don't attempt to have it run for over 10 seconds, and wait at least 1 minute prior to trying to re-start it again , otherwise, it will easily get the battery and the starter be damaged and shorten their service life. In case you can't

7. Maintenance



start it after 3-time attempts, then stop and check what's wrong with it. Only after the problem is eliminated, can you restart it again.

- c. Immediately after the engine being started, release the starter-control switch. It is strictly prohibited to let the starter work while the engine is running.
- d. Clean the starter regularly. And check the armature length (should be not less than 2/3 of a new armature) and the electric brush elasticity. And don't forget to grease the starter bearings.

2) Maintenance for battery

In order to keep the battery be at proper working performance and prolong its service life, the following maintenance jobs should be done.

- a. Check if there is electrolyte leakage from the battery.
- b. Check if the battery is securely fastened on the machine, and check if the connections at two poles are well fixed.
- c. Clean the battery and keep its surface free of dust or oily dirt. And keep the electrolyte-filling cover with good ventilation, and clean off the oxide at the battery poles and connections.
- d. Check the discharging status of the battery. If necessary, get it recharged.

3) Maintenance for tachometer

- a. The wiring connection to the tachometer should be fastened correctly.
- b. In case of replacing tachometer, make sure the new tachometer should be compatible to its sensor. Otherwise it will affect its normal performance.

7.4 Maintenance for Wheel Loader Under Special Environment

(Please see the table 07-01)

Ambient condition	Precaution Points for Maintenance
Muddy ground, or weather with much raining or snowing	Before machine operation: check to see if all the plugs and drainage plugs are securely screwed. After machine operation: Clean the machine body and check if all the bolts or nuts get broken, damaged, loosening or missing. Grease all the necessary parts without any delay.
Near the seashore	Before machine operation: check to see if all the plugs and drainage plugs are securely screwed. After the machine operation: Wash the machine body with fresh water to keep the machine free of salty water. More maintenance should be often made to the electrical system parts, so as to prevent corrosion.
In the air with much dust and sand	Air filter: Clean the filter core in short intervals Radiator: Clean timely the hood of the radiator to prevent the radiator being blocked. Fuel system: Clean the filter core and filter mesh in short intervals. Electrical system: Clean the electrical parts to keep them free of dust, particularly keep the wiring connection end of the AC generator and the starter clean.
Terrain with much stones	Tires: Drive the machine carefully. And often check the tires appearance and their rims to see if there is any breaking or missing nuts or bolts. If necessary, install a tire-protection chain. Attachments at the front of the machine: When the machine shoveling material at a terrain with much stones, the standard bucket could be not enough to endure such tough working condition and could be damaged very soon. So it is recommended to use hard bucket or stone-type bucket. In addition, according to different machine application and working condition, please select suitable and applicable working attachment.



Ambient condition	Precaution Points for Maintenance
Freezing weather	Fuel: Please use the high-quality fuel applicable to the low ambient temperature. Oil liquid: Please use high-quality hydraulic oil and engine oil with low viscosity. Engine coolant: Anti-freezing coolant is mandatory. Battery: Give more maintenance to the battery in the short intervals and get the battery recharged more frequently. Otherwise the battery electrolyte could be frozen if without discharging it. Tires: Keep the tires clean. And park the machine onto a solid area to avoid machine tires being frozen onto ground.
With much falling stones	Operation cab: If necessary, install a protection ceiling, so as to protect machine operator and machine itself from be damaged by falling stones.

The table 07-01

7.5 Maintenance Standard

7.5.1 Standard for Filling Oil Liquid And Engine Coolant

(1) Oil Liquid Filling

Filling amount for oil liquid

Please see the table 03-03 for reference on how much amount of oil should be refilled.

Filling Standard

● Filling fuel

Keep a close watch for the fuel level, which is showed in the control panel. When the fuel level is insufficient, please refill in with fresh fuel.

● Filling engine oil

Take out the engine oil dip-stick and clean it, afterwards, insert it and take it out again, and see at which scale that oil level lies. If the oil level is between the upper scale and lower scale of the oil dip-stick, it means the oil level is all right. If the oil level is below the lower scale of oil dip-stick, then replenish with fresh engine oil till up to the upper scale. To check engine oil level should only be done before starting the machine or 15 minutes later after the engine stops running.

7. Maintenance



- Filling oil for transmission system

The torque converter and the gearbox share the same transmission oil, so more strict check and maintenance should be given to them periodically.

When the oil temperature is 40°C while the engine runs at low idle, the oil level in transmission system should be at the lower scale of the oil dip-stick. If the oil temperature is 80°C-90°C while the engine runs at idle speed, then the oil level should be located at the upper scale of oil dip-stick. If finding the oil level is not enough, then replenish with fresh transmission oil. If the oil level is too high, then unfasten the oil-draining plug at the bottom of the gearbox for draining off excessive oil.

- Filling hydraulic oil

Check the oil dip-stick in hydraulic oil tank. The oil level must be kept above the middle scale of the oil-dipstick. If necessary, replenish with fresh hydraulic oil.

- Filling gear oil

Unscrew the oil-filling plug on the axle housing. If finding the oil level is just up to the plug, it will be all right. If finding the oil level is too low, replenish fresh oil with same quality. If finding oil flowing out, it means there is too much oil in the axle, so you need to drain off excessive oil.

- Filling brake liquid

Screw off the cover of oil cup and inspect the distance from liquid level to filling port. Fill the brake liquid if the liquid level is insufficient.

- Filling grease

Fill grease to all lubrication point till there is grease flowing out.

(2) Filling engine coolant

Open the radiator cover. If finding the coolant level is too low, replenish more coolant. Bear it in mind that it will take a little while for the coolant to get fully circulating inside the radiator system. So if you fill coolant too quickly, it seems that the radiator is full of coolant, but as a matter of the fact, the coolant level will be lowering down. Therefore, during filling coolant to the radiator slowly, keep a watch on the coolant level to see if its level will get down. Stop filling coolant when you find its level won't get down as time going.

△ Never attempt to open the radiator cover immediately after the engine stop running or during the engine running. Otherwise it will be dangerous, as high-temperature coolant will be sprayed out.

7.5.2 Maintenance Standard for Key Working System And Components

In order to provide a good reference schedule for the machine operators and services people, we hereby outline the common standard for maintaining the key working system and components of the machine.

△ When making tests, checks, adjustments and maintenance and repair with reference to the standard data (values), please obey the following notes:

- 1) The data as shown in the following table is the standard value for a new machine, which is the reference data when ex-works. Such data can only be taken as the reference when making judgment or repairing to the machine.
- 2) The allowable data as shown in the table is only the estimated data when machine ex-works, so when making a judgment for a machine problem, please also look up the information regarding previous repair records or any other information about the machine operation.

All this standard data should not taken as a base for making claims.

Standard of Fastening Torque

Standard of fastening torque for assembling transmission system parts (See Fig. 07-19)

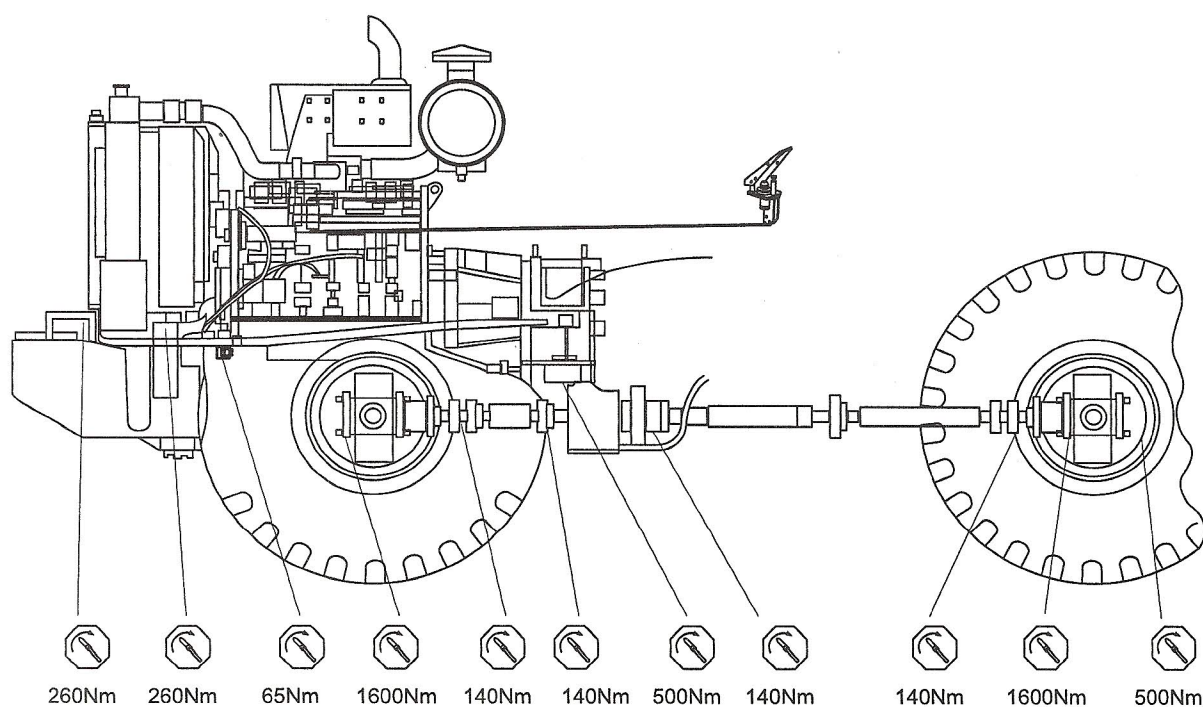


Fig. 07-19

Fastening torque standard for installing the pilot pump and the steering pump (See Fig. 07-20)

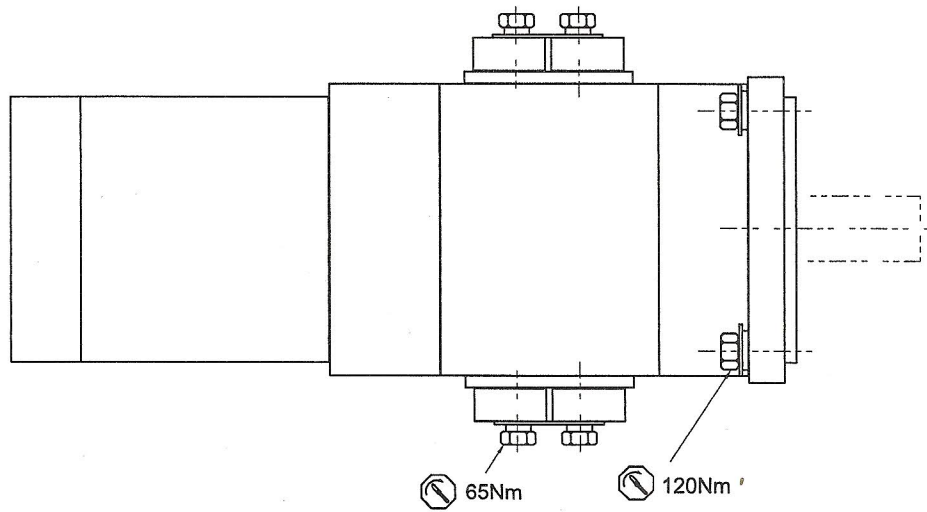


Fig. 07-20

Fastening torque standard for installing power pump for hydraulic system (See Fig. 07-21)

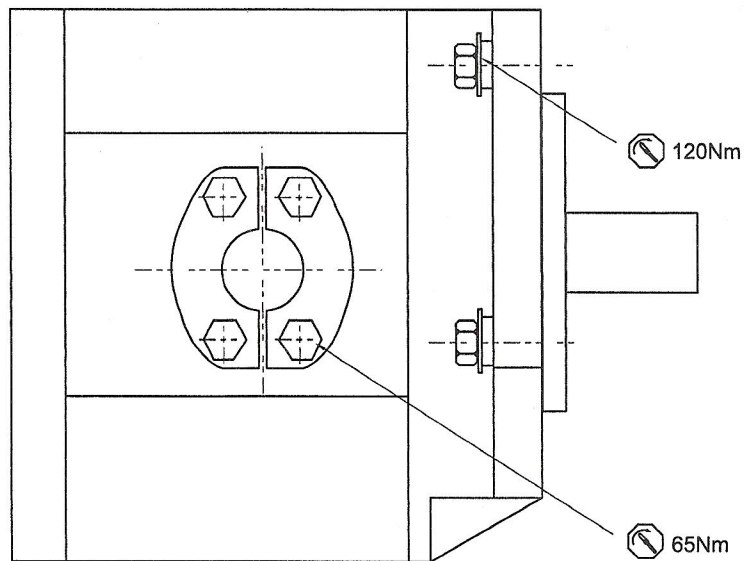


Fig. 07-21

Fastening torque standard for installing cylinders (See Fig. 07-22 (a) and (b))

1) Steering cylinder

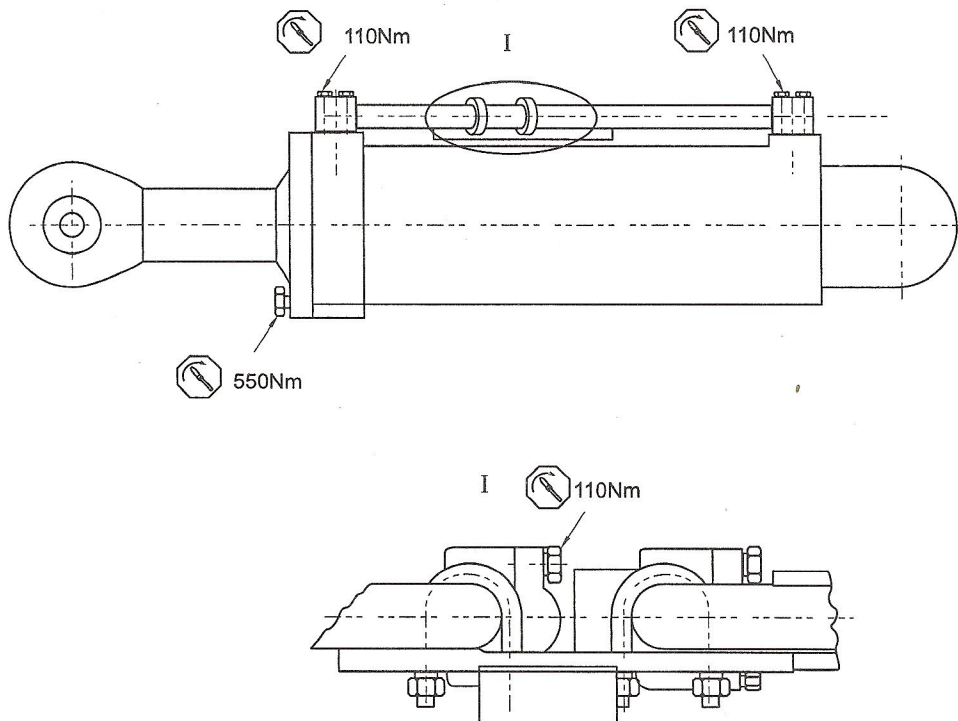


Fig. 07-22 (a)

2) Boom cylinder

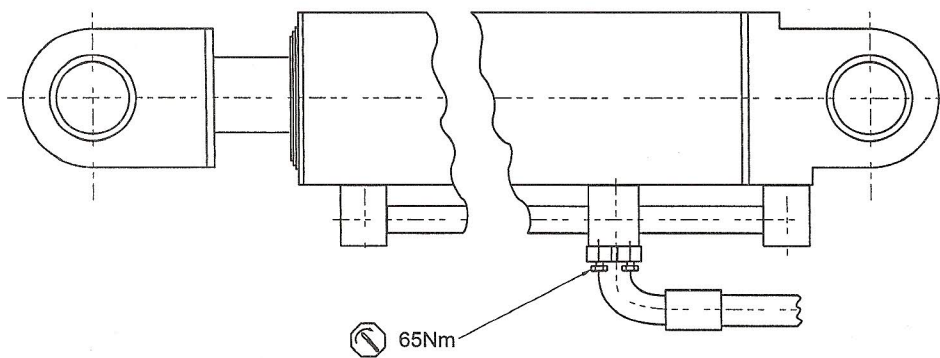


Fig. 07-22 (b)

Fastening torque standard for installing position sensors (See Fig. 07-23)

(Including: the bucket self-leveling sensor and the boom-raising limit sensor)

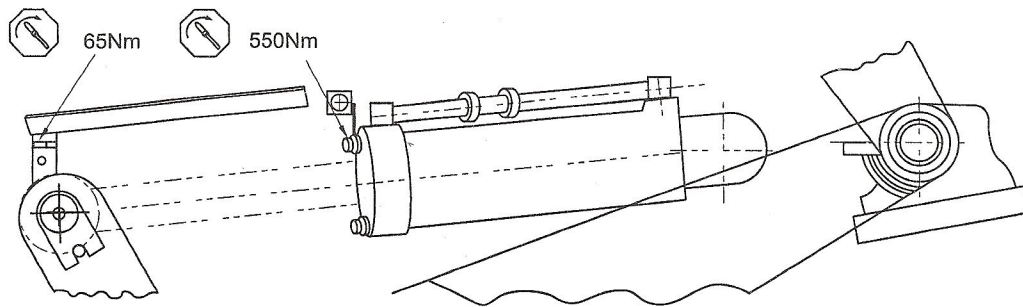


Fig. 07-23

Fastening torque standard for installing the bucket teeth (See Fig. 07-24)

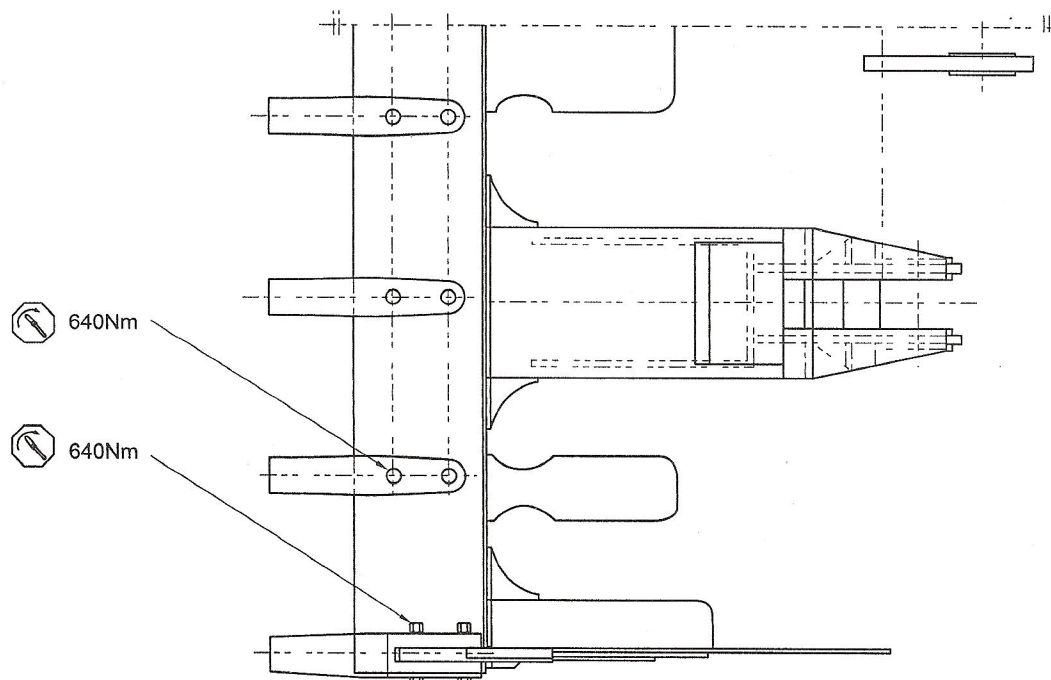


Fig. 07-24

Maintenance Standard for Working Mechanism

Maintenance standard for link-bars of the working mechanism (See Fig. 07-25)

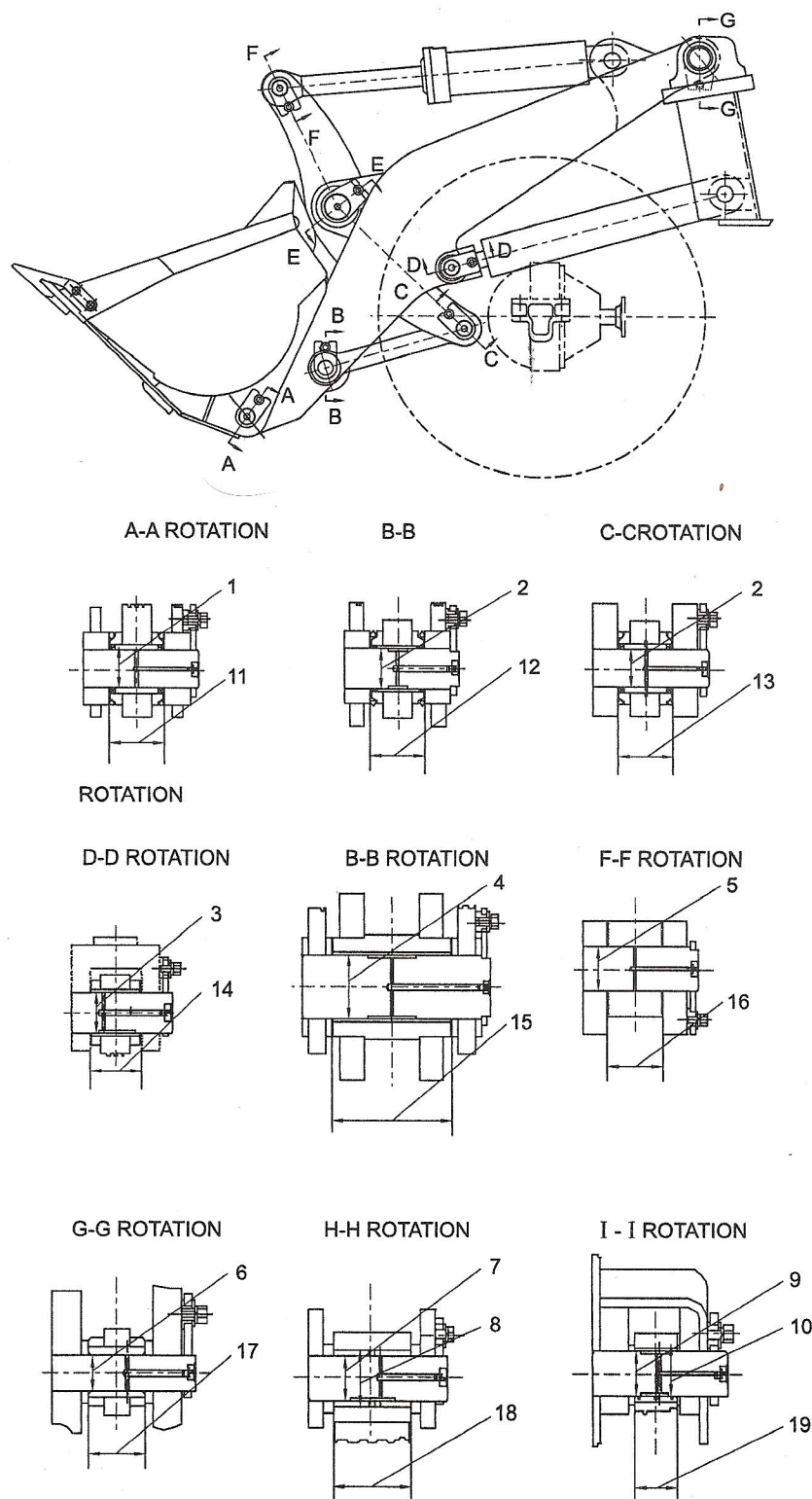


Fig. 07-25

7. Maintenance



No.	Description	Standard (unit: mm)					Measures
		Standard size	Tolerance		Standard clearance	Clearance limit	Replace it, especially if the pin shaft is damaged.
			Shafts	Holes			
1	Clearance at the joint location between the boom and the bucket.	80	0 -0.035	+0.274 +0.200	0.200~ 0.309	1.0	
2	Clearance between the pins and their sleeves of bucket linking-bars.	80	0 -0.035	+0.274 +0.200	0.200~ 0.309	1.0	
3	Clearance between the joint pins and their sleeves of the boom cylinder and the boom.	70	0 -0.030	+1.0 +0.5	0.5~ 1.03	1.5	
4	Clearance between the joint pins and their sleeves of the boom and swinging-arm.	130	0 -0.04	+0.56 +0.46	0.46~ 0.6	1.0	
5	Clearance between joint pins and swinging-arm holes.	80	0 -0.035	+0.2 +0.1	0.1~ 0.235	1.0	
6	Clearance between joint pins and their sleeves connecting boom and machine frame.	105	0 -0.035	+1.0 +0.5	0.5~ 1.035	1.5	
7	Clearance between joint pins and their sleeves connecting bucket cylinder and machine frame.	80	0 -0.035	+0.48 +0.36	0.36~ 0.515	1.0	
8	Clearance between the bucket cylinder and its joint sleeve	100	+0.106 +0.071	+0.054 0	-0.106~ -0.017	0.2	
9	Clearance between the joint pin and its sleeve connecting boom cylinder and machine frame.	80	0 -0.030	+0.48 +0.44	0.44~ 0.51	2.0	
10	Clearance between the boom cylinder and its joint sleeve connecting the machine frame.	100	+0.106 +0.071	+0.054 0	-0.106~ -0.017	0.2	

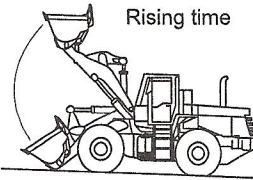
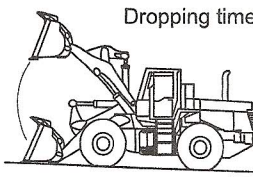
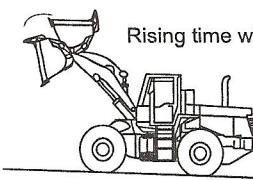
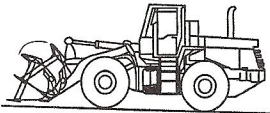
7. Maintenance



No.	Description	Standard (unit: mm)				Measures
		Standard size	Tolerance		Standard clearance	Clearance limit
			Shafts	Holes		
11	At the joint place of the boom and bucket.	Width of convex surface	Width of joint chain		Standard limit	Clearance after adjustment
		110	114_0^{+1}		4~5	2.0
12	At the joint place of linking-bar and the bucket.	110	114 ± 0.5		3.5~4.5	2.0
13	At the joint place of linking-bar and the swinging arm.	110	114_0^{+1}		4~5	2.0
14	At the joint place of the boom and boom cylinder	90	95 ± 1		4~6	2.0
15	At the joint place of the boom and the swinging arm.	245	249 ± 0.5		3.5~4.5	2.0
16	At the joint place of the swinging arm and the bucket cylinder	110 ± 1	114_0^{+1}		3~6	2.0
17	At the joint place of the boom and the machine frame	122	128_0^{+2}		6~8	2.0
18	At the joint place of bucket cylinder and the machine frame.	135 ± 1	140 ± 1		3~7	2.0
19	At the joint place of boom cylinder and the machine frame	90 ± 0.5	94 ± 0.5		3~5	2.0

Change it if the clearance is still beyond the standard requirement after it being adjusted by inserting a padding plate on both sides.

Standard for operation speed and for sensor switches clearances

Description			Testing Condition	Unit	Standard Data on a New Machine	Allowable limits
Boom speed	Raising		● Engine speed: high idle ● Hydraulic speed: 45-55°C ● Engine water temperature: within its working temperature range. ● Without being loaded. ● Articulated joint is in alignment. ● The bucket is lowered down to ground . (How long it needs to raise the bucket from its lowest position to the highest position).  	s	6.5 ± 0.5	8.0
	Lowering			s	4.0 ± 0.5	5.1
Bucket speed	Tilting forward	Full travel	● Engine speed: high idle ● Hydraulic speed: 45-55°C ● Engine water temperature: within its working temperature range. ● Without being loaded.  	s	1.2 ± 0.3	2.1
		Full travel		s	2.2 ± 0.3	2.8
	Tilting backward	Bucket being in leveling position		s	1.4 ± 0.3	1.8

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Description	Testing Condition	Unit	Standard Data on a New Machine	Allowable limits
Clearance between the approximate switch and bucket positioning	Hydraulic oil temperature: 45-55°C	mm	3-7	Till the sensor is not sensible anymore.
Clearance between the approximate switch and the boom positioning		mm	3-7	Till the sensor is not sensible anymore

Fig. 07-02

Maintenance standard for the articulated joint (See Fig. 07-26)

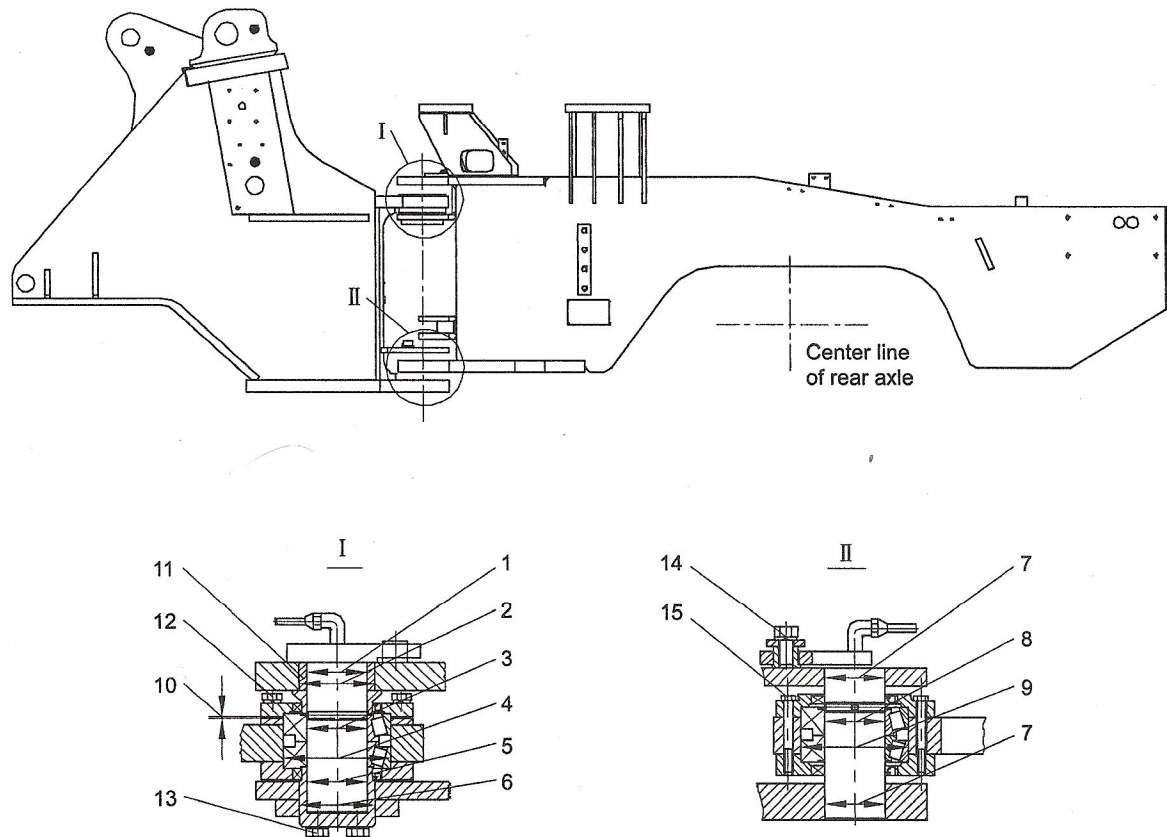


Fig. 07-26

7. Maintenance



No.	Description	Standard (unit: mm)					Measures
		Standard size	Tolerance		Standard clearance	Clearance limit	Replace it if the clearance limit has been exceeded or the pinshaft and shaft sleeve has been damaged
			Shafts	Holes			
1	Clearance between upper joint pin and its sleeve.	85	0 -0.022	+0.172 +0.150	0.150~ 0.194	1.0	
2	Clearance between the upper sleeve and the rear machine frame	105	+0.094 +0.079	+0.054 0	-0.094~ -0.025	0.2	
3	Clearance between the upper joint pin and the bearing.	85	0 -0.022	0 -0.020	-0.020~ 0.022	0.2	
4	Clearance between the upper bearing and the front machine frame.	150	0 -0.020	+0.026 -0.014	-0.014~ 0.046	0.2	
5	Clearance between the upper joint pin and it lower cover.	85	0 -0.022	+0.08 +0.05	0.05~ 0.102	1.0	
6	Clearance between the lower cover of upper joint with the rear machine frame.	105	-0.05 -0.08	+0.054 0	0.05~ 0.134	1.0	
7	Clearance between the lower joint pin and rear machine frame.	85	0 -0.022	+0.054 0	0.076~ 0	1.0	
8	Clearance between the lower joint pin and the bearing	85	0 -0.022	0 -0.020	-0.020~ 0.022	0.2	
9	Clearance between the lower joint bearing and the rear machine frame.	150	0 -0.020	+0.026 -0.014	-0.014~ 0.046	0.2	
10	Value of the upper bearing cover and pad of front machine frame.	Size		Note			
		0.2、0.5、1.0		Please select a proper one to use according to specific situation.			
11	Height of upper sleeve	Standard size 38		Tolerance 0 -0.5	Size after being repaired 36		
12	Fastening torque for the bolts on the upper joint bearing cover.	176 ± 29N.m(18 ± 3kg.m)					

7. Maintenance



13	Fastening torque for the bolts on the lower end cover of upper joint.	$383 \pm 39\text{N.m}$ ($39 \pm 4\text{kg.m}$)	
14	Fastening torque for the bolts on the lower end cover	$112 \pm 9.8\text{N.m}$ ($11.4 \pm 1\text{kg.m}$)	
15	Fastening torque for the bolts on the lower joint pin.	$549 \pm 58\text{N.m}$ ($56 \pm 6\text{kg.m}$)	

Maintenance standard for the pins on steering cylinders (See Fig. 07-27)

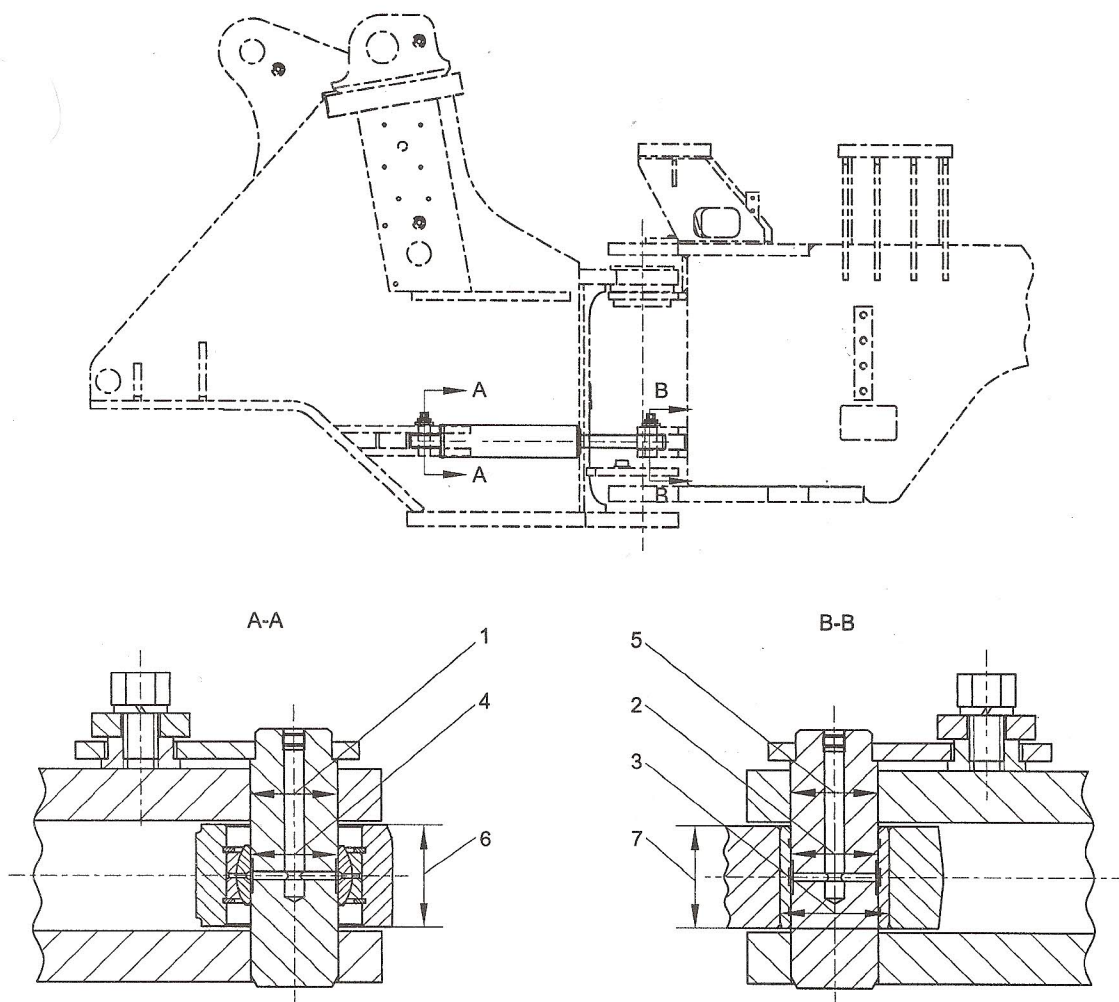


Fig. 07-27

7. Maintenance



No.	Description	Standard (unit: mm)					Measures
		Standard size	Tolerance		Standard clearance	Clearance limit	
			Shafts	Holes			
1	Clearance between the joint pin and the bearing connecting the steering cylinder and the front machine frame.	40	0~ -0.039	0~ -0.012	-0.012~ 0.039	1.0	
2	Clearance between the joint pin and sleeve connecting the steering cylinder and the rear machine frame.	40	0~ -0.039	+0.372~ +0.31	0.31~ 0.441	1.0	
3	Clearance between the cylinder and joint sleeve connecting steering cylinder and the rear machine frame.	50	+0.068~ +0.043	+0.039~ 0	-0.068~ -0.004	0.2	
4	Clearance between the machine frame and joint pin connecting the steering cylinder and the front machine frame.	40	0~ -0.039	+0.142~ +0.080	0.080~ 0.181	1.0	
5	Clearance between the machine frame and joint pin connecting the steering cylinder and rear machine frame.	40	0~ -0.039	+0.142~ +0.080	0.080~ 0.181	1.0	
		Width of convex surface	Width of joint chain		Standard limit	Clearance after adjustment	Replacement
6	At the articulated joint of the steering cylinder and the front machine frame.	48 ± 0.5	52 ₀ ⁺¹		3.5~5.5	1.0	
7	At the articulated joint of the steering cylinder and the rear machine frame.	48 ± 0.5	52 ₀ ⁺¹		3.5~5.5	1.0	

8. Accessories Specifications and List of Easy-worn Parts

8.1 Working Range (Fig. 08-01)

This drawing mainly provides customers with operation reference value when changing different accessories at the front of the machine:

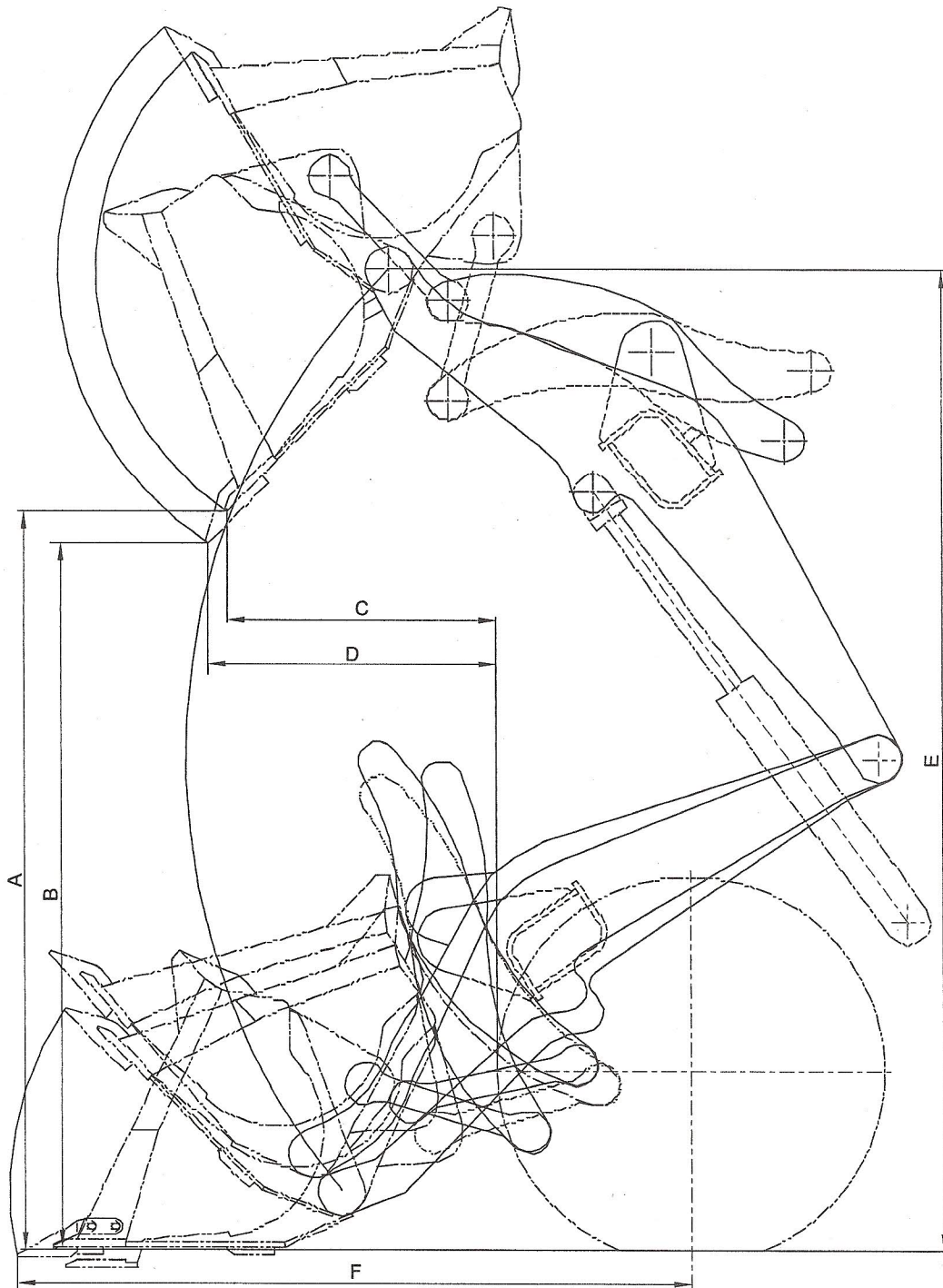


Fig. 08-01

8.2 Table 08-01:Table of Accessories for Different Working Apparatus

Operation data change with the different accessories for the front working apparatus (Customers can select required accessories base on the real situation, unit in the following table is "mm".)

Access.Type	Normal Boom				High Discharge Boom	
	Normal BucketZ5G.8.1E	Normal BucketZ5G.8.1G	Rock Bucket526G.8.1	Light Material BucketZ5G.20.1B	Normal BucketZ5G.21.1C	Light Material BucketZ5G.21.1
ItemData	With Bucket Tooth and Edge tooth	With Changeable Tooth Seat, Tooth Sleeve And Vice Cutting Plate	With Changeable Tooth Seat and Tooth Sleeve	With Changeable Vice Cutting Edge	With Bucket Tooth and Edge tooth	With Changeable Vice Cutting Edge
Rated Bucket Capacity	3.0	3.0	2.5	3.5		3.5
A: Discharge Height (at cutting edge)	3090	3090	3106	2988	2.7 3710	3606
B: Discharge Height (at rear end of bucket tooth)	2955	2895	2996	2915	3570	3550
C: Discharge Distance (at cutting edge)	1130	1130	1212	1230	1180	1287
D: Discharge Distance (at rear end of bucket tooth)	1205	1260	1277	1256	1254	1300
E: Max. Height of Boom pin	4110	4110	4110	4110	4726	4726
F: Distance from front end of bucket tooth to center of front wheel when shoveling	2810	2880	2925	2865	3425	3475
Remarks	Boom: Z5G.8.2 Pullrod: Z5G(YS).8.3 Rocker: Z5G.8.4B				Boom: Z5G.21.2 Pullrod: Z5G(YS).8.3 Rocker: Z5G.8	



8.3 Table 08-02: Table of Bucket Types and Applications

This table mainly provides the external operation data of bucket and specifications and recommended density standards of bucket tooth accessories.

Bucket Type		Bucket Capacity		Specifications and Drawing No. of Bucket Tooth	Bucket Width		Density Standards of Shovelling Materials
		Rated	Heap		Include edge tooth	Not include edge tooth	
Normal Bucket	With Bucket Tooth and Edge tooth	3.0	2.47	Mid. tooth: ZL40A.11.1-18B Edge tooth: Z5G.8.1-1	3000	3000	Less than 1670kg/m ³
	With Changeable Tooth Seat and Tooth Sleeve	3.0	2.47	Mid. tooth: JR-01 Edge tooth: JR-02	3018	3000	Less than 1670kg/m ³
Rock Bucket	With Changeable Tooth Seat and Tooth Sleeve	2.5	2.1	Tooth Sleeve:526G.8.1-6 Tooth Pin:526G.8.1.2 Left fender:526G.8.1-3 Middle Fender:526G.8.1-4 Right fender:526G.8.1-5 Sleeve of two sides:526G.8.1-1	3029	3020	Less than 2000kg/m ³
Light Material Bucket	With Changeable Vice Cutting Edge	3.5	3.1	Vice Cutting Edge:Z5G(CS).8.1A-1	3000	3000	Less than 1430kg/m ³
High Discharge Bucket	With bucket tooth and Edge tooth	2.7	2.2	Middle tooth:ZL40A.11.1-18B Edge tooth:Z5G.8.1-1	3000	3000	Less than 1850kg/m ³
	With Changeable Vice Cutting Edge	3.5	3.1	Vice Cutting Edge:Z5G(CS).8.1A-1	3000	3000	Less than 1430kg/m ³

Notes:

- 1) Values listed in Table 08-01 are related to tyre pressure and type.

8. Accessories Specifications and List of Easy-worn Parts



2) Other distortion working tools (such as clamp and side tilt etc.), as accessories of the machine, are not listed in Table 08-01 and Table 08-02.

3) Customers can select proper bucket accessories based on material density (For this machine).

4) Important reminding: operation with improper accessories like bucket and boom etc. may cause severe damage to the front structure of the machine such as pull-rod, rocker and hydraulic cylinder.

The following lists provide maintainers and customers with easy-worn parts at every maintenance stage as detailed as possible (but in real situation of operation and maintenance, contents in Table 08-03 to 08-06 may not be all-sided, so please contact your local dealer of XCMG or Xugong Science & Technology Co., Ltd. when you need any technical support).

8.4 Table 08-03: List of Easy-worn Parts Within 500 hr (including 500 hr) (Unit: piece/set)

No.	Description	Code	Quantity	Remarks
1	Air filter	AH19227-C	1	Cummins C8.3 engine
2	Air filter	KLB-14-000	1	Shangchai 6121 engine
3	O-ring 70 × 3	0634 306 287	1	ZF gearbox
4	O-ring 25 × 3	0634 313 260	1	ZF gearbox
5	O-ring 35 × 2	0634 306 525	1	ZF gearbox
6	O-ring 23 × 2	0634 303 233	1	ZF gearbox
7	O-ring 57 × 3	0634 313 529	1	ZF gearbox
8	O-ring 49 × 3	0634 313 536	1	ZF gearbox
9	O-ring 48 × 4	0634 303 466	2	ZF gearbox
10	O-ring 27 × 2.5	0634 303 283	2	ZF gearbox
11	Piston sealing ring	0634 402 025	1	ZF gearbox
12	Piston sealing ring	0734 401 078	1	ZF gearbox
13	Piston sealing ring	0734 317 252	1	ZF gearbox
14	Piston packing	0734 401 106	9	ZF gearbox
15	Piston packing	0750 112 139	6	ZF gearbox
16	Piston packing	0750 112 140	6	ZF gearbox
17	V-ring AV 55	0630 531 346	6	ZF gearbox
18	Filter	0750 131 053	1	ZF gearbox
19	O-ring	932041	4	VOLVO front and rear axle hub
20	HMS4 Oil seal 150 × 180 × 15	53500009	2	Meritor front and rear axle
21	HMSA7 Oil seal 80 × 180 × 10	53500007	1	Meritor front and rear axle
22	HMS4 Oil seal 80 × 180 × 10	53500008	1	Meritor front and rear axle
23	O-ring	83000810	2	Meritor front and rear axle

8. Accessories Specifications and List of Easy-worn Parts



No.	Description	Code	Quantity	Remarks
24	Oil filling filter	XGKL2-10 × 0.63/ XGKL6-10 × 1.0S	1	Fuel tank
25	Oil suction filter	XGXL5-10 × 100	1	Fuel tank
26	O-ring 82.5 × 3.55	GB3452.1-1992	1	Hydraulic oil tank
27	Oil suction filter	XGXL1-630 × 100F	1	Hydraulic oil tank
28	Oil return filter	XGHL6-700 × 10	1	Hydraulic oil tank
29	Air filter	XGKL2-10 × 0.63	1	Hydraulic oil tank
30	O-ring 40 × 3.55	GB3452.1-1992	1	Steering hydraulic system
31	O-ring 30 × 3.55	GB3452.1-1992	4	Steering hydraulic system
32	O-ring 47.5 × 3.55	GB3452.1-1992	1	Steering hydraulic system
33	O-ring 32.5 × 3.55	GB3452.1-1992	1	Steering hydraulic system
34	O-ring 42.5 × 3.55	GB3452.1-1992	2	Working hydraulic system
35	O-ring 34.5 × 3.55	GB3452.1-1992	4	Working hydraulic system
36	O-ring 40 × 3.55	GB3452.1-1992	2	Working hydraulic system
37	O-ring 61.5 × 3.55	GB3452.1-1992	2	Working hydraulic system
38	O-ring 50 × 3.55	GB3452.1-1992	2	Working hydraulic system
39	Anti-dust ring	Z5G.8-5	8	Working apparatus
40	Oil seal B80 × 100 × 10	GB9877.1-88	8	Working apparatus
41	Fuse box	XGBX508-2	1	Electrical System
42	Working lamp	XGGD03	2	Electrical System
43	Working lamp	XGGD06	2	Electrical System
44	Rear large lamp	TCM large lamp	2	Electrical System
45	Rear small lamp	XH8-2L2-1	2	Electrical System
46	Flasher	SG252	1	Electrical System
47	Cylinder sealing of the machine			

8.5 Table 08-04: List of Easy-worn Parts Within 1000 hr (unit: piece/set)

No.	Description	Code	Quantity	Remarks
1	Air filter	AH19227-C	1	Cummins C8.3 engine
2	Air filter	KLB-14-000	1	Shangchai 6121 engine
3	O-ring 70 × 3	0634 306 287	1	ZF gearbox
4	O-ring 25 × 3	0634 313 260	1	ZF gearbox
5	O-ring 35 × 2	0634 306 525	1	ZF gearbox
6	O-ring 23 × 2	0634 303 233	1	ZF gearbox
7	O-ring 57 × 3	0634 313 529	1	ZF gearbox
8	O-ring 49 × 3	0634 313 536	1	ZF gearbox

8. Accessories Specifications and List of Easy-worn Parts



No.	Description	Code	Quantity	Remarks
9	O-ring 48 × 4	0634 303 466	2	ZF gearbox
10	O-ring 27 × 2.5	0634 303 283	2	ZF gearbox
11	Piston sealing ring	0634 402 025	1	ZF gearbox
12	Piston sealing ring	0734 401 078	1	ZF gearbox
13	Piston sealing ring	0734 317 252	1	ZF gearbox
14	Piston packing	0734 401 106	9	ZF gearbox
15	Piston packing	0750 112 139	6	ZF gearbox
16	Piston packing	0750 112 140	6	ZF gearbox
17	V-ring AV 55	0630 531 346	6	ZF gearbox
18	Filter	0750 131 053	1	ZF gearbox
19	Gearshift control rod	4644	1	ZF gearbox
20	Oil seal FB150 × 180 × 15	53100006	2	Meritor front and rear axle
21	HMS4 Oil seal 150 × 180 × 15	53500009	2	Meritor front and rear axle
22	HMSA7 Oil seal 80 × 180 × 10	53500007	1	Meritor front and rear axle
23	HMS4 Oil seal 80 × 180 × 10	53500008	1	Meritor front and rear axle
24	O-ring	83000810	2	Meritor front and rear axle
25	Oil filling filter	XGKL2-10 × 0.63/ XGKL6-10 × 1.0S	1	Fuel tank
26	Oil suction filter	XGXL5-10 × 100	1	Fuel tank
27	O-ring 82.5 × 3.55	GB3452.1-1992	1	Hydraulic oil tank
28	Oil suction filter	XGXL1-630 × 100F	1	Hydraulic oil tank
29	Oil return filter	XGHL6-700 × 10	1	Hydraulic oil tank
30	Air filter	XGKL2-10 × 0.63	1	Hydraulic oil tank
31	Liquid level	YWZ-250	1	Hydraulic oil tank
32	O-ring 20 × 2.65	GB3452.1-1992	1	Leading hydraulic system
33	Leading valve	DXS-00 / 5THF6EXX-20	1	Leading hydraulic system
34	O-ring 40 × 3.55	GB3452.1-1992	1	Steering hydraulic system
35	O-ring 30 × 3.55	GB3452.1-1992	4	Steering hydraulic system
36	O-ring 47.5 × 3.55	GB3452.1-1992	1	Steering hydraulic system
37	O-ring 32.5 × 3.55	GB3452.1-1992	1	Steering hydraulic system
38	Steering unit	BZZ3-125	1	Steering hydraulic system
39	Flow amplified valve	ZLF25A1	1	Steering hydraulic system
40	O-ring 42.5 × 3.55	GB3452.1-1992	2	Working hydraulic system
41	O-ring 34.5 × 3.55	GB3452.1-1992	4	Working hydraulic system
42	O-ring 40 × 3.55	GB3452.1-1992	2	Working hydraulic system
43	O-ring 61.5 × 3.55	GB3452.1-1992	2	Working hydraulic system
44	O-ring 50 × 3.55	GB3452.1-1992	2	Working hydraulic system

8. Accessories Specifications and List of Easy-worn Parts



No.	Description	Code	Quantity	Remarks
45	Hydraulic multi-path valve	D32	1	Working hydraulic system
46	Anti-dust ring	Z5G.8-5	8	Working apparatus
47	Oil seal B80 × 100 × 10	GB9877.1-88	8	Working apparatus
48	Edge tooth	Z6G.8.1-1	2	Standard bucket
49	Bucket tooth	85Z.12-2	6	Standard bucket
50	Middle tooth	JR-01	6	Rock bucket
51	Edge tooth assembly	JR-02	2	Rock bucket
52	Fuse box	XGBX508-2	1	Electrical System
53	Working lamp	XGGD06	2	Electrical System
54	Working lamp	XGGD03	2	Electrical System
55	Rear large lamp	TCM large lamp	2	Electrical System
56	Rear small lamp	XH8-2L2-1	2	Electrical System
57	Flasher	SG252	1	Electrical System
58	Shake-absorbing pad	Z5G(V).10-1	12	Cab
		Z5G.10-8	16	FOPS&ROPSCab
59	Rearview mirror	EQ142	2	
60	Cylinder sealing of the machine			

8.6 Table 08-05: List of Easy-worn Parts Within 1500hr (unit: piece/set)

No.	Description	Code	Quantity	Remarks
1	Air filter	AH19227-C	1	Cummins C8.3 engine
2	Air filter	KLB-14-000	1	Shangchai 6121engine
3	O-ring 70 × 3	0634 306 287	1	ZF gearbox
4	O-ring 25 × 3	0634 313 260	1	ZF gearbox
5	O-ring 35 × 2	0634 306 525	1	ZF gearbox
6	O-ring 23 × 2	0634 303 233	1	ZF gearbox
7	O-ring 57 × 3	0634 313 529	1	ZF gearbox
8	O-ring 49 × 3	0634 313 536	1	ZF gearbox
9	O-ring 48 × 4	0634 303 466	2	ZF gearbox
10	O-ring 27 × 2.5	0634 303 283	2	ZF gearbox
11	Piston seal ring	0634 402 025	1	ZF gearbox
12	Piston seal ring	0734 401 078	1	ZF gearbox
13	Piston seal ring	0734 317 252	1	ZF gearbox
14	Piston packing	0734 401 106	9	ZF gearbox
15	Piston packing	0750 112 139	6	ZF gearbox
16	Piston packing	0750 112 140	6	ZF gearbox

8. Accessories Specifications and List of Easy-worn Parts



No.	Description	Code	Quantity	Remarks
17	V-ring AV 55	0630 531 346	6	ZF gearbox
18	Filter	0750 131 053	1	ZF gearbox
19	Gear-shift control rod	4644	1	ZF gearbox
20	Bolt	ZL50F(CS).3-1	4	Transmission shaft
21	Bolt	85ZIII.01-4	8	Transmission shaft
22	Oil seal FB150 × 180 × 15	53100006	2	Meritor front and rear axle
23	HMS4 Oil seal 150 × 180 × 15	53500009	2	Meritor front and rear axle
24	HMSA7 Oil seal 80 × 180 × 10	53500007	1	Meritor front and rear axle
25	HMS4 Oil seal 80 × 180 × 10	53500008	1	Meritor front and rear axle
26	O-ring	83000810	2	Meritor front and rear axle
27	Oil filling filter	XGKL2-10 × 0.63/ XGKL6-10 × 1.0S	1	Fuel tank
28	Oil suction filter	XGXL5-10 × 100	1	Fuel tank
29	O-ring 82.5 × 3.55	GB3452.1-1992	1	Hydraulic oil tank
30	Oil suction filter	XGXL1-630 × 100F	1	Hydraulic oil tank
31	Oil return filter	XGHL6-700 × 10	1	Hydraulic oil tank
32	Air filter	XGKL2-20 × 0.63	1	Hydraulic oil tank
33	Liquid level	YWZ-250	1	Hydraulic oil tank
34	O-ring 20 × 2.65	GB3452.1-1992	1	Leading hydraulic system
35	Leading valve	DXS-00 / 5 THF6EXX-20	1	Leading hydraulic system
36	O-ring 40 × 3.55	GB3452.1-1992	1	Steering hydraulic system
37	O-ring 30 × 3.55	GB3452.1-1992	4	Steering hydraulic system
38	O-ring 47.5 × 3.55	GB3452.1-1992	1	Steering hydraulic system
39	O-ring 32.5 × 3.55	GB3452.1-1992	1	Steering hydraulic system
40	Steering unit	BZZ3-125	1	Steering hydraulic system
41	Flow amplified valve	ZLF25A1	1	Steering hydraulic system
42	O-ring 42.5 × 3.55	GB3452.1-1992	2	Working hydraulic system
43	O-ring 47.5 × 3.55	GB3452.1-1992	1	Working hydraulic system
44	O-ring 34.5 × 3.55	GB3452.1-1992	4	Working hydraulic system
45	O-ring 40 × 3.55	GB3452.1-1992	2	Working hydraulic system
46	O-ring 61.5 × 3.55	GB3452.1-1992	2	Working hydraulic system
47	O-ring 50 × 3.55	GB3452.1-1992	2	Working hydraulic system
48	Hydraulic multi-path valve	D32	1	Working hydraulic system
49	Shaft sleeve	Z6A.05.2-2	2	Working device
50	Shaft sleeve	Z5G.8-2	1	Working device
51	Shaft sleeve	Z6G.8-4	2	Working device

8. Accessories Specifications and List of Easy-worn Parts



No.	Description	Code	Quantity	Remarks
52	Shaft sleeve	Z5G.8-6A	4	Working device
53	Adjustable pad	ZL50E.6-19	15	Working device
54	Adjustable pad	ZL50E.8-12	4	Working device
55	Adjustable pad	85Z.6-2	4	Working device
56	Anti-dust ring	Z5G.8-5	8	Working device
57	Oil seal B80 × 100 × 10	GB9877.1-88	8	Working device
58	Edge tooth	Z6G.8.1-1	2	Normal bucket
59	Bucket tooth	85Z.12-2	6	Normal bucket
60	Middle tooth unit	JR-01	6	Rock bucket
61	Edge tooth unit	JR-02	2	Rock bucket
62	Fuse box	XGBX508-2	1	Electrical system
63	Working lamp	XGGD06	2	Electrical system
64	Working lamp	XGGD03	2	Electrical system
65	Rear large lamp	TCM large lamp	2	Electrical system
66	Rear small lamp	XH8-2L2-1	2	Electrical system
67	Flasher	SG252	1	Electrical system
68	Shock-absorber pad	Z5G(V).10-1	12	Cab
		Z5G.10-8	16	FOPS & ROPS Cab
69	Rearview mirror	EQ142	2	
70	Backboard rubber	Z5G(V).10II-01	1	Cab
		Z5G(CE).10II-01	1	FOPS & ROPS Cab
71	Cylinder seal of the machine			

8.7 Table 08-06: List of Easy-worn Parts Within 2000hr (unit: piece/unit)

No.	Description	Code	Quantity	Remarks
1	Air filter	AH19227-C	1	Cummins C8.3 engine
2	Air filter	KLB-14-000	1	Shangchai 6121 engine
3	O-ring 70 × 3	0634 306 287	1	ZF gearbox
4	O-ring 25 × 3	0634 313 260	1	ZF gearbox
5	O-ring 35 × 2	0634 306 525	1	ZF gearbox
6	O-ring 23 × 2	0634 303 233	1	ZF gearbox
7	O-ring 57 × 3	0634 313 529	1	ZF gearbox
8	O-ring 49 × 3	0634 313 536	1	ZF gearbox
9	O-ring 48 × 4	0634 303 466	2	ZF gearbox
10	O-ring 27 × 2.5	0634 303 283	2	ZF gearbox
11	Piston seal ring	0634 402 025	1	ZF gearbox

8. Accessories Specifications and List of Easy-worn Parts



No.	Description	Code	Quantity	Remarks
12	Piston seal ring	0734 401 078	1	ZF gearbox
13	Piston seal ring	0734 317 252	1	ZF gearbox
14	Piston packing	0734 401 106	9	ZF gearbox
15	Piston packing	0750 112 139	6	ZF gearbox
16	Piston packing	0750 112 140	6	ZF gearbox
17	V-ring AV 55	0630 531 346	6	ZF gearbox
18	Roller bearing	0635 416 285	1	ZF gearbox
19	Roller bearing	0750 116 134	1	ZF gearbox
20	Roller bearing	0750 116 259	2	ZF gearbox
21	Filter	0750 131 053	1	ZF gearbox
22	Gear-shift control rod	4644	1	ZF gearbox
23	Bolt	ZL50F(CS).3-1	4	Transmission shaft
24	Bolt	85ZIII.01-4	8	Transmission shaft
25	Ventilation stuff Z1/8"	56100001	1	Meritor front and rear axle
26	Washer 20	52020008	20	Meritor front and rear axle
27	Nut M20 × 1.5	51010007	20	Meritor front and rear axle
28	Rim nut M20 × 1.5	80688001	20	Meritor front and rear axle
29	Rim nut M20 × 1.5	80350001	20	Meritor front and rear axle
30	Friction plate	75700463	8	Meritor front and rear axle
31	Planetary wheel pad	75600457	16	Meritor front and rear axle
32	Oil seal FB150 × 180 × 15	53100006	2	Meritor front and rear axle
33	HMS4 Oil seal 150 × 180 × 15	53500009	2	Meritor front and rear axle
34	HMSA7 Oil seal 80 × 180 × 10	53500007	1	Meritor front and rear axle
35	HMS4 Oil seal 80 × 180 × 10	53500008	1	Meritor front and rear axle
36	Ring 50	52100009	2	Meritor front and rear axle
37	O-ring	83000810	2	Meritor front and rear axle
38	Nut M14 × 1.5	75501992	12	Meritor front and rear axle
39	Bolt M14 × 1.5 × 50	75500003	12	Meritor front and rear axle
40	Adjusting spacer of bearing	75201730	1 Group	Meritor front and rear axle
41	Adjusting shim	75200123	1 Group	Meritor front and rear axle
42	Planetary gear pad	82030507	4 Group	Meritor front and rear axle
43	Half gear pad	82030504	2 Group	Meritor front and rear axle
44	Screw plug	75500197	2	Meritor front and rear axle
45	Combination seal pad 24	53200005	2	Meritor front and rear axle
46	Filling filter	XGKL2-10 × 0.63/ XGKL6-10 × 1.0S	1	Fuel tank
47	Oil suction filter	XGXL5-10 × 100	1	Fuel tank

8. Accessories Specifications and List of Easy-worn Parts



No.	Description	Code	Quantity	Remarks
48	O-ring 82.5 × 3.55	GB3452.1-1992	1	Fuel tank
49	Oil suction filter	XGXL1-630 × 100F	1	Fuel tank
50	Oil return filter	XGHL6-700 × 10	1	Fuel tank
51	Air filter	XGKL2-10X0.63	1	Fuel tank
52	Liquid level	YWZ-250	1	Fuel tank
53	O-ring 20 × 2.65	GB3452.1-1992	1	Leading hydraulic system
54	Leading valve	DXS-00 / 5 THF6EXX-20	1	Leading hydraulic system
55	O-ring 40 × 3.55	GB3452.1-1992	1	Steering hydraulic system
56	O-ring 30 × 3.55	GB3452.1-1992	4	Steering hydraulic system
57	O-ring 47.5 × 3.55	GB3452.1-1992	1	Steering hydraulic system
58	O-ring 32.5 × 3.55	GB3452.1-1992	1	Steering hydraulic system
59	Steering-gear	BZZ3-125	1	Steering hydraulic system
60	Flow amplify valve	ZLF25A1	1	Steering hydraulic system
61	O-ring 42.5 × 3.55	GB3452.1	2	Working hydraulic system
62	O-ring 34.5 × 3.55	GB3452.1	4	Working hydraulic system
63	O-ring 40 × 3.55	GB3452.1	2	Working hydraulic system
64	O-ring 61.5 × 3.55	GB3452.1	2	Working hydraulic system
65	O-ring 50 × 3.55	GB3452.1	2	Working hydraulic system
66	Multi-path valve	D32	1	Working hydraulic system
67	Shaft sleeve	Z6A.05.2-2	2	Working device
68	Shaft sleeve	Z5G.8-2	1	Working device
69	Shaft sleeve	Z6G.8-4	2	Working device
70	Shaft sleeve	Z5G.8-6A	4	Working device
71	Adjustable pad	ZL50E.6-19	15	Working device
72	Adjustable pad	ZL50E.8-12	4	Working device
73	Adjustable pad	85Z.6-2	4	Working device
74	Anti-dust ring	Z5G.8-5	8	Working device
75	Oil seal B80 × 100 × 10	GB9877.1-88	8	Working device
76	Edge tooth	Z6G.8.1-1	2	Normal bucket
77	Bucket tooth	85Z.12-2	6	Normal bucket
78	Middle tooth	JR-01	6	Rock bucket
79	Edge tooth unit	JR-02	2	Rock bucket
80	Bucket pin	Z6G.8.6	4	Working device
81	Fuse box	XGBX508-2	1	Electrical system
82	Working lamp	XGGD06	2	Electrical system
83	Working lamp	XGGD03	2	Electrical system

8. Accessories Specifications and List of Easy-worn Parts



No.	Description	Code	Quantity	Remarks
84	Rear large lamp	TCM large lamp	2	Electrical system
85	Rear small lamp	XH8-2L2-1	2	Electrical system
86	Flasher	SG252	1	Electrical system
87	Shock-absorber pad	Z5G(V).10-1	12	Cab
88		Z5G.10-8	16	FOPS & ROPS Cab
89	Rearview mirror	EQ142	2	
90	Backboard rubber	Z5G(V).10II-01	1	Cab
91		Z5G(CE).10II-01	1	FOPS & ROPS Cab
92	Cylinder seal of the machine			

Note: Please refer to the attached Operation & Maintenance Manual of engine for its List of Easy-worn Parts.

9. Brief Introduction of Maintenance

9. Brief Introduction of Maintenance



After the loader has been used for a while, every system or component may have different degree of wear and looseness. Timely and planned maintenance and repair can reduce trouble incidence and extend service life of the machine. In order to help operators or maintainers to service the machine better, this chapter gives a brief introduction of the common technology on maintenance and lists several examples for reference.

9.1 Classification of Maintenance

According to the periodic maintenance system, maintenance of loaders is divided into three classes, i.e. small repair, medium repair and major repair.

(1) Small repair

After the loader has been used for a while, some important components such as diesel engine, hydraulic components, working device or transmission parts may have partial wear and damage which can not be solved completely through maintenance, then resumptive repairs should be taken to keep the machine with good performance. This kind of repair is called small repair.

(2) Medium repair

Medium repair means that the loader is not due for major repair, but has already had very serious accidents, such as severe damage or distortion of boom unit, bucket or other working tools, transmission components and one or more hydraulic components which have to be repaired to make the machine back to normal conditions.

(3) Major repair

Generally speaking, after 4000~5000 hours of operation or consumption of certain amount of fuel, loaders can not work properly, diesel engine and hydraulic components are severely worn or damaged, hydraulic oil is getting deteriorated, easy-worn parts have been worn down to limit dimensions, working device or structures such as chassis have cracks, strength is obviously lower than the allowed fluctuation range of the designing standards, and can not be resumed to the best performance through normal maintenance, small repair and medium repair. Therefore, an overall disassembly, restoration and change should be made, which is called major repair. Machines after major repair should be up to the technical standards of major repair and basically restored to the original performance.

Under general situation, major repair of loaders should include the followings:

- 1) Dismounting, cleaning, checking and identifying of the machine.
- 2) Diesel engine, pumps, valves and oil cylinders after major repair and changing of easy-worn parts and sealing components should be tested and make records of testing data and repair details, and all the changed parts should have qualified certification.

9. Brief Introduction of Maintenance

- 3) It is necessary to measure the wear amount of working device unit and easy-worn parts such as pin shaft, shaft sleeve and bucket tooth, and make build-up welding and changing if necessary.
- 4) Make correction or shearing and mending if mechanical structures are out of shape; make patch welding, painting, electroplating, grinding or changing if necessary when they are severely worn or damaged.
- 5) Instruments, accessories, electrical components, decorations, pipelines (hose or hard pipes) and electrical wires should be prepared if necessary when they are lost or damaged. The machine should be cleaned after testing and meeting the technical standards of major repair.
- 6) Besides the above mentioned, special repair should be done according to the damaging characteristics of the machine and make detailed records.

9.2 Examples of Several Familiar Maintenance

9.2.1 Repairs of crack welding seam and steel material

(1) Repair of crack welding seam

Original welding seams are not high enough or through welding may cause welding seams crack (caused by welding quality problem or fatigue due to frequent stress on welding place). Therefore, adopt the measure stated in Fig. 09-01 for restoration.

- 1) Open a 60° groove again at the original cracking place (See Fig. 09-01) which is longer than 30mm at both ends of the welding seam.
- 2) Weld at both sides or one side again, welding height equals to the thickness of the mother-board.

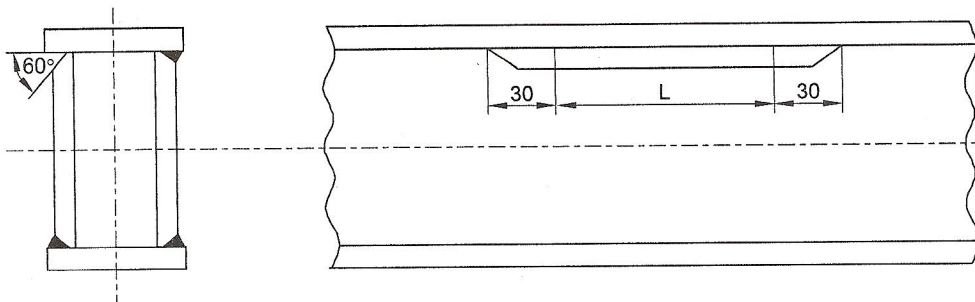


Fig. 09-01 Restoration sketch of crack welding seam (L is the length of crack)

(2) Repair of crack steel material

Crack steel material normally has two situations: one is crack of flat steel plate, which mainly refers to the working device, distorting operation tools and large square of steel plate at the front and rear framework for loaders; another one is crack of steel plate at the surroundings of pin shaft hole bracket which is caused by huge torsional force suffered by this part or area and in a complex forcing status or caused by over huge, sudden and frequent impacting loads, which mainly refer to the surroundings of articulated pins on the working device and operating tools for loaders, such as connecting areas of boom with bucket etc.

a. For cracks of flat steel plate, please adopt the method and steps of restoration showed in Fig. 09-02:

- 1) Drill a hole with a diameter of 2~3 times big of the crack width at the end of the crack to prevent extending of the crack, as showed in Fig. 09-02 (a).
- 2) Chisel a 60° groove along the both sides of the crack, as showed in Fig. 09-02 (b).
- 3) Build-up weld the groove. Place a joint plate of generating the arc 1 at the crack of the mother-board edge (See Fig. 09-02(c)), and build-up weld to 1~2 mm higher than the mother-board, and then cut the joint plate of generating the arc 1 and make grinding.
- 4) Grind the welding seam with a portable grinding wheel to make it as high as the mother-board.
- 5) Select a reinforced backing board with a proper thickness (normally is 1/2 thick of the mother-board), which is shaped like 3 showed in Fig. 09-02.
- 6) Cling weld the reinforced backing board, and the position of the reinforced backing board is symmetrical to the two sides of the welding seam.

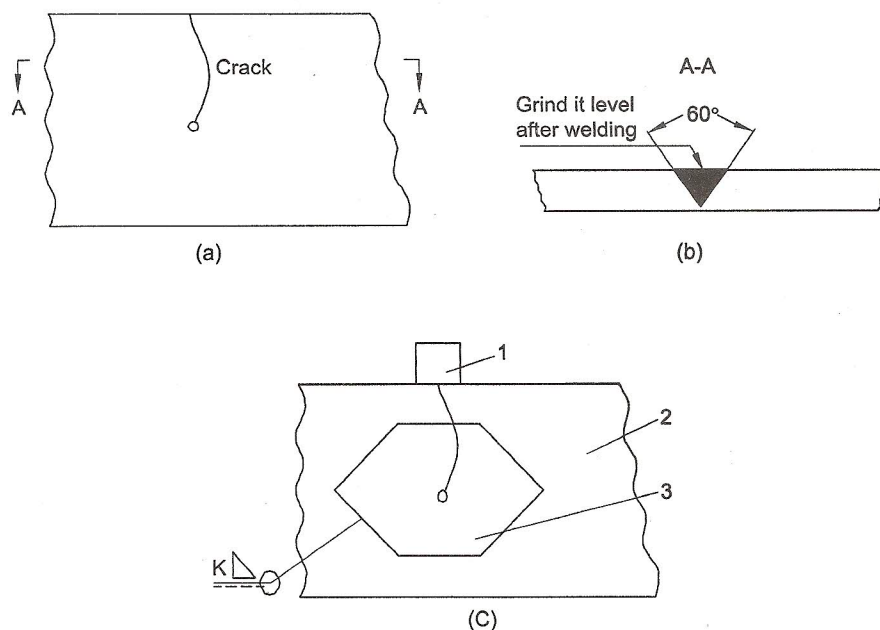


Fig. 09-02 Restoration sketch of crack steel plate

1. Joint plate of generating the arc 2. Mother-board 3. Reinforced backing board

b. For cracks of steel plate at the surroundings of pin shaft hole bracket, please adopt the method and steps of restoration showed in Fig. 09-03:

- 1) Select a reinforced ring plate with a thickness of a little bit smaller than the height which is distance of the shaft bracket higher above the mother-board and with a inner diameter of 8~10 mm larger than the outer diameter of the shaft bracket, and the outer circum should have a welding seam height to the edge of the bordering mother-board.
- 2) Grind the welding seams for connecting the shaft bracket and the mother-board until the reinforced ring plate can stick to the mother-board tightly.
- 3) Drill a hole with a diameter of 2~3 times big of the crack width at the end of the crack to prevent extending of the crack, chisel and weld a 60° groove along the both sides of the crack and then make grinding.
- 4) Cling weld the reinforced ring board to the mother-board (as showed in Fig. 09-03b).

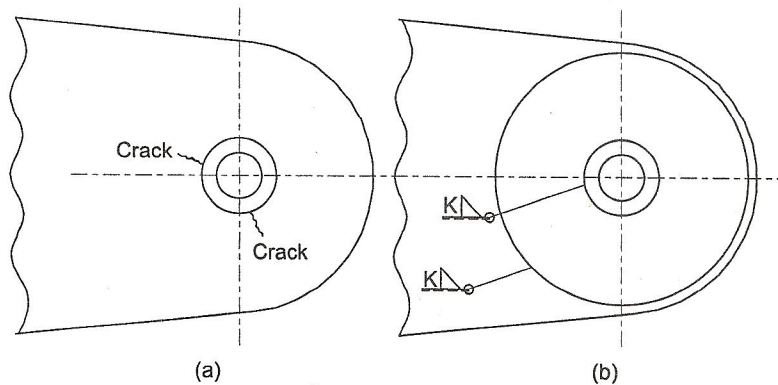


Fig. 09-03 Restoration sketch of crack steel plate at the surrounding of pin shaft bracket

9.2.2 Repairs of severely worn pin shafts, shaft sleeves and pin shaft holes

Pin shafts of loaders normally adopt 40# chrome steel or 45# steel, which are made by turning and heating treatment. Shaft sleeve normally adopt high strength nylon or double metal. Wear limit of fit clearance between pin shafts and their holes is 3mm, which means before reaching the wear limit, timely repairs should be carried out. The following methods are only appropriate for those within the wear limit, please change with new components for those beyond the wear limit.

(1) Repairs of severely worn pin shafts

When the wearout of pin shafts is less than 0.5mm, make repair with brush plating; when the wearout is bigger than this, make repairs with build-up welding or change with new ones. When build-up welding, pay attention to the followings:

- 1) Clean away oil dirt from the surface of pin shafts first.
- 2) Based on the diameter of pin shafts, cross weld at points of four, six, eight, twelve or sixteen etc as showed in Fig. 09-04.
- 3) When build-up welding, cross weld back and forth at both the left and right directions and in accordance with the sequence of one, two, three---sixteen as showed in Fig. 09-04.
- 4) When build-up welding, the latter welding seam should cover half of the former welding seam. After build-up welding and cooling, machine the pin shaft to make the matching dimension with the pin shaft hole or sleeve meeting with the original technical requirement.

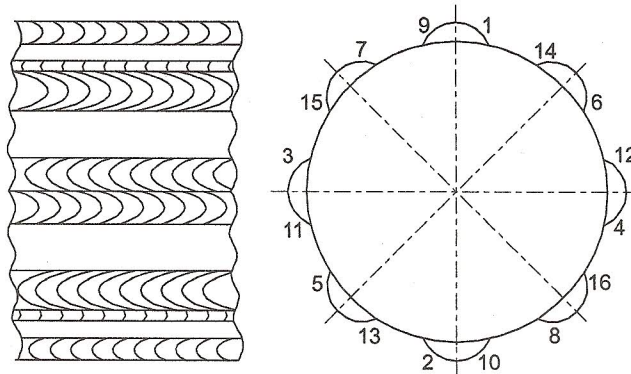


Fig. 09-04 Restoration sketch of severely worn pin shafts

(2) Repairs of severely worn pin shaft holes

Wearout of pin shaft holes normally have two situations: one is the surrounding of the holes have severe even wearout and bias wearout is not serious; another one is bias wearout is very serious. Repairs for these two kinds are basically same, the following method is appropriate for both of the situations.

- 1) Boring. Keep the inner and outer circles have the same shaft as much as possible.
- 2) Measure the diameters of the bored hole and the pin shaft, turn and inlay a bush (material of the bush should be the same with the shaft sleeve or bracket), the outer circle of the bush should be matching with a shrink range, and the fit clearance between the bush inner hole and the pin shaft should be within the allowed tolerance range.
- 3) Chamfer a 45° angle at the outer circle of the bush and inlay the machined bush into the shaft bracket, and then weld the bush (at the chamfer) with the shaft bracket.

(3) Repairs of severe worn pin shafts and shaft sleeves

Pin shafts and shaft sleeves normally have wearout or pasting (i.e. holding-on), and the wearout limit of the matching clearance is 2.5~3mm, so timely repairs before reaching the limit should be carried out in case that pin shafts may be burned out and affect running and operation of the machine. The following methods can be adopted for repair.

- 1) Turn the inner diameter of shaft sleeves bigger, and reduce the inner roundness as much as possible, build-up weld the shaft and then grind it to make the matching dimensions with the shaft sleeve meet with the requirements; besides, pin shafts and shaft sleeves should be used monogamously.
- 2) Inlay a bush inside of the shaft sleeve and make the fit clearance between the new bush and the machined pin shaft meet with the requirements.

9.2.3 Repairs of hydraulic oil cylinder

Common troubles of hydraulic oil cylinder include: wearout of sealing ring; scratch, collision and bending of piston rod and pull, peeling and corrosion of chromeplating layer and pull and partial rustiness of cylinder drum. For the former, change with new sealing rings can prevent leakage; for the latter, repairs should be carried out.

(1) Repairs of piston rod

- 1) If the piston rod has slight scratch or collision, grind with oilstone or grinding cream to make the surface slick. If repairs can not be carried out timely, oil sealing may be damaged.
- 2) If the chromeplating layer has been scratched or peeled and corroded for a large area, grind off the chromeplating layer completely and then chromeplate again with a thickness of 0.03~0.05mm for a single side.
- 3) If the piston rod is bending, make correction by the method of static pressure cold correction (See Fig. 09-05). When doing correction, the two points of the fulcrum bearing and the pressing point of the oil pressure should be cushioned with copper sheet, aluminum sheet or wool felt etc, and check with clock gauge for several times. After the linearity meets with the requirement, grind, chromeplate and polish it again.

(2) Repairs of cylinder drum

Common troubles of cylinder drum are pulling and partial rustiness etc. Make repairs by honed finishing and grinding the cylinder drum, the cylindricity should be 0.01~0.04mm, the linearity should be less than 0.03mm within 100mm, and the surface roundness should not be larger than Ra0.4. The inner diameter of the honed finished cylinder drum is increased, so the bush or piston back-up ring should be monogamously equipped again to keep a fit clearance.

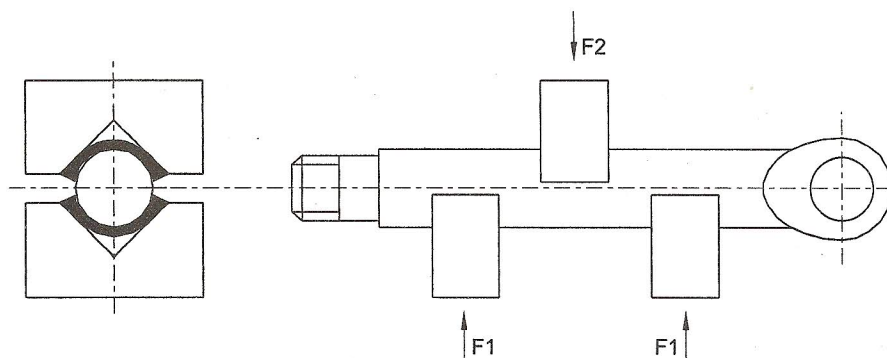


Fig. 09-05 Correction sketch of piston rod

9. Brief Introduction of Maintenance



(3) Test after the hydraulic oil cylinder is repaired

After the hydraulic oil cylinder is repaired, make pressurization and sealing tests on the testing trestle or on the loader after being assembled on.

If making test on the loader, do the impacting tests for several times while steering the machine left and right to limit position and making the working device at limit status (including lift cylinder and tilt cylinder) and check for external leakage; and under the situation of lifting up the bucket with full loads to the highest position, all control valves backing to neutral position and extinguishing the engine, the bucket has no obvious falling within 10 minutes.

If making tests on the testing trestle for pressurization, there should be no internal or external leakage when the pressure reaches 40MPa.

When making no-load tests, if the pressure is 1.0MPa or the piston rod is locked, that means the fit clearance between the bush or piston back-up ring with the cylinder drum is too small and the piston sealing is too tight. Then the piston back-up ring should be readjusted or changed with new one.