

Maintenance Manual



Caution: Please carefully read and understand the contents of the manual, so that you can correctly maintain the machine. Proper maintenance is of great significance for the safety and the extension of the service life of the machine.

Run-in of New Motor Grader

Run-in of new motor grader plays an important role for extending the service life of machine, eliminating the hidden danger and preventing the occurrence of a major accident. After the purchase of the machine, users should conduct the operation and maintenance for the machine according to the provisions for the run-in of new vehicle in the manual, and then the machine can be used properly.

Requirements for Run-in of New Motor Grader

- The run-in term of new motor grader is 100 hours.
- Every time when starting up, run it at idle speed for 5 minutes. Machine should start at stably low speed and small accelerator and then gradually increase the speed.
- During the run-in process, each of the forward gears I, II, III, IV, V, VI and reverse gears I, II, III should be running-in uniformly.
- Except for the emergency, it is necessary to avoid the sudden start, acceleration, steering and braking.
- During the run-in period, scraping the loose material is appropriate and the work should not be too hasty. The workload should not exceed 70% of the rated value and running speed should not exceed the 70% of the maximum rated value.
- Attention should be paid to the lubrication of machine; change or add the lubricating oil and grease according to the specified cycle.
- Attention should be frequently paid to the gearbox, torque converter, front and rear axles, hub, parking brake and middle bearing shaft as well as the temperature of hydraulic oil, engine coolant and engine oil, and if the overheating is found, it is necessary to find out the cause and eliminate it.
- Check the fastening situation of the bolts and nuts of all parts.

Following work should be done after 8-hour run-in of new motor grader

- Take a comprehensive examination for the fastening situation of bolts and nuts of all parts, particularly the bolt of diesel engine cylinder head, bolt of exhaust pipe, fixing bolt of front and rear axles, nut of wheel rim, connecting bolt of transmission shaft, fixing bolt of diesel engine and gearbox, and bolt at the articulated place between the front and rear frames.
- Check the degree of tightness for the fan belt, generator belt, air-conditioning compressor belt.
- Check the oil level of gearbox, driving axle and diesel engine.
- Check the hydraulic and brake system for leakage.
- Check the connection of all controlling pull rods and throttle pull rods.
- Check the temperature and connection of all parts of electrical system, power supply of generator, lighting and turn signal lamp.

 **Caution:** All kinds of oil level should be checked according to the relative operational procedures.

Following work should be done after the finish of run-in of new motor grader

- Take a comprehensive examination for the fastening situation of bolts and nuts of all parts,

particularly the bolt of diesel engine cylinder head, bolt of exhaust pipe, fixing bolt of front and rear axles, nut of wheel rim, connecting bolt of transmission shaft, fixing bolt of diesel engine and gearbox, and bolt at the articulated place between the front and rear frames.

- Check the degree of tightness for the fan belt, generator belt, air-conditioning compressor belt.
- Check the tightness of hydraulic system and brake system.
- Change the transmission oil of gearbox and the lubricating oil of driving axle.
- Replace the secondary filter of gearbox oil and clean the primary filter of gearbox oil.
- Clean the oil-return filter core of hydraulic oil tank.

Caution: The transmission oil of gearbox, lubricating oil of driving axle and secondary filter of gearbox oil should be replaced according to the relevant operational procedures.

Regular Maintenance

 **Caution: it is necessary to read and understand all the safety information, warnings and instructions prior to any operation or maintenance.**

Liugong Machinery Co., Ltd. requires that the maintenance work should be done using the first due cycle between the time-table and calendar (day, week, month, etc.). Under the extremely harsh, dusty or humid work environment, the lubrication and maintenance more frequent than specified in the “regular maintenance” are necessary.

When taking the maintenance, maintenance items listed in the original requirements should be repeated. For example, the maintenance items listed in “per 250 work hours or a month”, “per 50 work hours or a week” and “per 10 work hours or a day” should be carried out when taking the maintenance items listed in the “500 hours or 3 months”

Maintenance per 10 work hours or a day

- Check the storage battery and the switch of it.
- Check the engine oil level.
- Check the coolant level.
- Check the hydraulic oil level.
- Check the fuel level.
- Remove the fuel in the prefilter and engine and the water and impurity inside the diesel primary filter.
- Patrol check. (See the “patrol check” of “important maintenance procedure” for details)
- Check the engine fan and driving belt visually.
- Check the operating conditions of the lamp and instrument.
- Check the tyre air pressure and the damage of it.

- Check the operating conditions of reverse alarm.
- Add the lubricating grease into all the transmission shafts according to the instructions of complete-machine diagram posted on the machine.

Maintenance per 50 work hours or a week

First, conduct the above-mentioned check and maintenance items

- Check the oil level of gearbox.
- After first 50 work hours, it is necessary to check the gap between the brake shoe and brake drum of parking brake, and replace it if improper. Afterwards, check it per 250 work hours.
- Screw down the linking bolts of all transmission shafts.
- For the motor grader equipped with the air conditioner, clean the filter screens of air-return and new-air ports of air conditioner evaporator; check the degree of tightness of transmission belt of compressor and check the condenser for the oil pollution, dirt and other debris which affect the heat emission of condenser.
- Keep the binding post of storage battery clean and paint with vaseline to prevent the corrosion of acid mist on the post.
- Check the lubricated state of all lubrication points and add the lubricating grease to the lubrication points according to the lubrication diagram of complete machine posted on the machine.
- After the first 50 work hours, check the pre-charging pressure of nitrogen in the accumulator.

Maintenance per 100 work hours or 2 weeks

First, conduct the above-mentioned check and maintenance items

- After the first 100 work hours, change the gearbox oil, and change it once every 1,000 work hours afterwards. Even if the number of work hours is less than the specified value, the gearbox oil should be changed once a year at least. Every time when replacing the gearbox oil, the secondary filter of gearbox should also be replaced.
- After the first 100 work hours, replace the driving axle, tandem and the gear oil of worm-gear box, and afterwards the driving axle, tandem and the gear oil of worm-gear box should be replaced once every 1,000 work hours. Even if the number of work hours is less than the specified value, the gear oil of driving axle should be changed once a year at least.
- Clean the engine cylinder head and the radiator set.
- Rinse the oil filling filter screen of fuel tank.
- After the first 100 work hours, check the pre-charging pressure of nitrogen in the accumulator.

Maintenance per 250 work hours or a month

First, conduct the above-mentioned check and maintenance items

- Check the fastening torque of the fixed bolt of wheel rim.
- Check the fastening torques of the mounting bolts of gearbox and engine.

- Check the operational device, the stress welding seam of front and rear frames and the fixed bolt for the crack and looseness.
- Check the oil levels of driving axle, tandem and worm-gear box.
- Check the blockage alarm lamp of air filter and the lamp goes on. The core of air filter should be cleaned or replaced.
- Check the air intake system of the engine.
- Change the engine oil and replace the oil filter.
- Replace the filter of engine coolant.
- After the first 250 work hours, clean the oil-return filter core of hydraulic system. Afterwards the oil-return filter core of hydraulic system should be replaced once every 1,000 work hours.
- Check the driving belt of engine, air conditioner compressor belt for the tension and damage.
- The machine equipped with the air conditioner should be checked with whether the refrigerant inside the reservoir is sufficient.
- For the machine equipped with the air conditioner, it is necessary to clean the air filters inside and outside cab.
- Detect the service brake and parking brake.
- After the first 250 work hours, check the pre-charging pressure of nitrogen in the accumulator.

Maintenance per 500 work hours or 3 months

First, conduct the above-mentioned check and maintenance items

- Check the concentrations of anti-freezing fluid and coolant additive.
- Replace the fuel prefilter and the fuel primary filter and secondary filter on the engine.
- Fasten the connecting bolt between the driving axle and frame.
- Check the fixed bolt of the articulated pin of frame for looseness.
- After the first 500 work hours, check the pre-charging pressure of nitrogen in the accumulator. Afterwards check the pre-charging pressure of nitrogen in the accumulator once every 1,000 work hours.

Maintenance per 1,000 work hours or 6 months

First, conduct the above-mentioned check and maintenance items

- Adjust the valve clearance of engine.
- Check the tension pulley bearing and fan shaft housing of engine.
- Change the gearbox oil and replace the oil filter of gearbox.
- Change the gear oil of driving axle, tandem and worm-gear box.
- Replace the oil-return filter core of hydraulic system.

- Rinse the fuel tank.
- Screw down all the fixed bolts of storage battery and clean the top of storage battery.
- Check the pre-charging pressure of nitrogen in the accumulator.
- For the machine equipped with the air conditioner, it is necessary to replace the air filter outside the cab.

Maintenance per 2,000 work hours or a year

First, conduct the above-mentioned check and maintenance items

- Change the hydraulic oil, rinse the oil tank and the oil absorption filter screen and check the oil suction pipe.
- Check the operational situation of service brake and parking brake systems and remove and check the friction plate for the friction state.
- Check the tightness of distribution valve and operational oil cylinder by measuring the natural settlement of oil cylinder.
- For the cab equipped with the air conditioner, it is necessary to check whether the cooling pipe and water pipe of air-conditioning system are broken, worn out or dipped in the oil pollution and check the pipe connector and pipe clamp for the looseness.
- For the machine equipped with the air conditioner, it is necessary to replace the air filter inside the cab.
- Check the steering system for the flexibility.
- Change the engine coolant, rinse the cooling system of engine and replace the engine coolant filter.

Maintenance per 6,000 work hours

- Check the shock absorber of crankshaft belt pulley of engine and replace it if necessary.
- Clean and repair or replace the engine nozzle.
- Clean and calibrate the fuel pump.
- Check the fan hub and repair or replace it if necessary.
- Overhaul the turbocharger.

General Specification of Torque

Unless the special statement is available, the bolts used by the machine should be screwed down according to the torques in the following table.

- Metric standard thread torque

Thread Size	Standard Torque lbf•ft (N•m)	
	Intensity of grade 8.8	Intensity of grade 10.9
M6	7.7±1.1 (10.5±1.5)	
M8	19±2.9 (26±4)	
M10	38±5 (52±7)	53±4 (72±6)
M12	66±9 (90±12)	89±7 (120±10)
M14	107±15 (145±20)	144±11 (195±15)
M16	166±26 (225±35)	225±18 (305±25)
M18	229±33 (310±45)	306±26 (415±35)
M20	302±37 (410±50)	443±37 (600±50)
M22	443±59 (600±80)	590±52 (800±70)
M24	561±74 (760±100)	752±74 (1,020±100)
M27	811±111 (1,100±150)	1,106±74 (1,500±100)
M30	1,106±148 (1,500±200)	1,364±11 (1,850±150)
M33	1,512±221 (2,050±300)	2,139±295 (2,900±400)
M36	1,955±258 (2,650±350)	2,286±184 (3,100±250)

- British standard thread torque

Thread Size	Standard Torque lbf•ft (N•m)
1/4	9±3 (12±4)
5/16	18±5 (25±7)
3/8	33±5 (45±7)
7/16	52±11 (70±15)
1/2	74±11 (100±15)
9/16	110±15 (150±20)
5/8	148±18 (200±25)
3/4	266±37 (360±50)
7/8	420±59 (570±80)
1	645±74 (875±100)

Air Charging Data of Tyre

Liugong proposed that tyre should be charged with dry nitrogen and the tyre pressure should be adjusted, which is for all the machines equipped with the rubber tyre. Nitrogen is an inert gas and will not support the combustion in the tyre.

The use of nitrogen (N₂) will not only reduce the risk of explosion, and also contribute to the prevention of oxidation and rubber aging as well as the corrosion of wheel rim parts. Tyre life can reach at least 4 years.



The operators using the air charging equipment should be trained properly, because using the incorrect air charging technology will lead to the casualties. Set the pressure of air charging equipment of tyre not higher than the recommended tyre pressure 140KPa (20 psi).

The check and adjustment of the air charging pressure of tyre should be conducted after the fully cooling of tyre and notify all other staff to leave the dangerous zone (around the tyre).

Nitrogen charging pressure is the same as the air charging pressure. Liugong advised that the air charging pressure should be determined according to the actual operating conditions of tyre.

The air charging pressure of tyre shown in the table is the value at the normal temperature

	MPa	psi
17.5-25	0.275±0.01	40±1.5

When the motor grader is traveling in the cold temperature, the tyre pressure will change greatly. The tyre which is charged sufficiently in the normal temperatures will be in a shortage of air pressure in the cold temperature. The rather low tyre pressure will shorten the service life.

Pressure Release



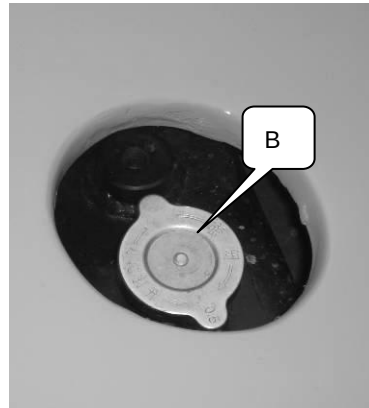
Hydraulic oil circuit has always been under the state of pressure, so when checking or replacing the pipe or hose, the circuit pressure should be released. If the pressure is not released, high-pressure oil will be emitted which would cause the serious personal injury.

After turning off the engine, parts, oil and the cooling water inside the radiator are still in the high temperature, which would cause the serious burns. At the beginning of the operation, wait for the temperature to fall.

When removing the oil filling cover and the water-filling cover of radiator, oil or water will blow out, so it is necessary to slowly rotate the cover prior to the removal of cover to release internal pressure.

Operation method of Pressure Release:

1. Park the machine on the level and solid ground. And lower all the devices down to the ground.
2. Within 15 seconds after the shutdown, turn the starting switch to the ON gear and operate the control lever towards all direction fully (operational device and running device) to release the internal pressure of operational device.
3. Slowly unscrew the oil filling cover A at the top of the hydraulic tank or water-filling cover B of the radiator to release the internal pressure.



4. The remaining pressure inside the hydraulic device can be released by unscrewing the fastening nuts between the hydraulic pipeline and then screw down them again. At the same time, be sure to collect the remaining oil inside the operational device.
5. Pressure release of the accumulator; see the “Maintenance of Accumulator” for details.

Technical Specification of Lubricating Oil

Changing Interval and Adding Capacity of Lubricating Oil

⚠ Caution: When carrying out the check, maintenance, test and adjustment to the motor grader, it is necessary to be prepared to use a suitable container to collect the liquid before removing any hydraulic oil circuit or disassembling any part containing the liquid. And dispose of all liquid in accordance with the local laws and regulations.

Changing Interval and Adding Capacity of Oil

Type	Changing Interval	Adding Capacity
Engine crankcase	250	22L
Gearbox system	1,000	45L
Hydraulic oil	2,000	186L
Fuel tank	Per day	230 L
Rear axle, tandem and worm-gear box	1,000	80L

Technical Specification of Oil

Type		Name		Applicable Position
		Summer oil	Winter oil	
Lubricating grease		★Molybdenum disulfide lithium-base lubricating grease No.2		For roller bearing, sliding bearing, axis pins of operational device, steering cylinder and frame, swing bracket of rear axle, spine of transmission shaft, universal joint and water pump shaft etc.
Torque converter oil		★Mobil Black King 1300 or engine oil of the levels higher than SAE15W-40 CF		For torque converter and power gear-shift gearbox
Hydraulic oil		★HM46 anti-wear hydraulic oil	HV46 anti-wear hydraulic oil	For the hydraulic system, brake system and steering hydraulic system of operational device
Engine oil		★Oil of the levels more than SAE/CF-4 15W-30	Oil of the levels more than SAE/CF-4 5W-30	For diesel engine
Engine Fuel	North	Light diesel No.0	Light diesel No.-35	For diesel engine
	South	Light diesel No.0	Light diesel No.0	
Gear oil		★SAE85W-90 GL-5 Heavy-load vehicle gear oil		Driving axle, tandem and worm-gear box

Notes: The ones marked with ★are the oil added before leaving the factory

Caution:

1. The oil of the same specification but different brands can not be mixed. If for any reason, it is necessary to use an oil of different brand, please rinse the system first.
2. If the motor grader has been used in the low-temperature and cold areas for long term, the HV46 low-temperature anti-wear hydraulic oil should be selected as the hydraulic oil, and the ATF220 or DEXRON-III or Donax TC transmission oil should be used for the gearbox.
3. It is necessary to replace a variety of lubricating oil, and even if the oil is very clean, it may degenerate if placed for a long period of time.
4. The fuel should be selected based on the local minimum temperature when using the machine.

Patrol Check

Caution: Closely observe the machine for leakage. If the leakage is found, it is necessary to find the source of leakage and repair it. If you suspect or find the leakage, be sure to frequently check the change of level.

- Check the hoses of cooling system and hydraulic system for the leakage and repair or replace it timely if necessary.
- Check the engine chamber and remove the accumulated debris from the engine chamber and on the radiator.
- Check the engine for any visible damage to the parts.
- Check the tyre for damage. Check the integrity of valve cap.
- Check the driving axle, tandem, worm-gear box and gearbox for the leakage and repair the leaking point if any.
- Check the hydraulic oil tank, all the hoses and tubes for the leakage. At the meantime check all the blanking plugs, sealers, connectors and nozzle for the leakage. Repair the leaking points and replace the hoses if necessary.

- Check all the operational devices and connecting rods for the wear and damage.
- Be sure that all the doors, overhaul covers and guard boards are solid. Overhaul the overhaul doors, overhaul covers and guard boards for the damage.
- Check the ladder, walkway and armrest. Remove all the debris. Repair any damage or replace the damaged parts.
- Check the roll-over protective structure (ROPS) for the visible damage and contact the Liugong agency for repair.
- Check all the lighting lamps and replace the damaged bulb and glass.
- Check the cab and keep the cab clean.
- Check the instrument and indicator lamp on the instrument panel for the damage and replace any damaged part.
- Check the seat belt, snap and mounting fastener and replace any worn or damaged part.
- Adjust the rear-view mirror and check the window to ensure that visual field is not affected and rinse the window if necessary.

Maintenance of Cooling System

Check of Coolant Level



Operating coolant is of the higher pressure and temperature. The hot coolant can cause the serious burns, so if it is necessary to shut down the engine and wait for the radiator to cool down before opening the cover, and then slowly unscrew the water-filling cover in order to release the internal pressure.

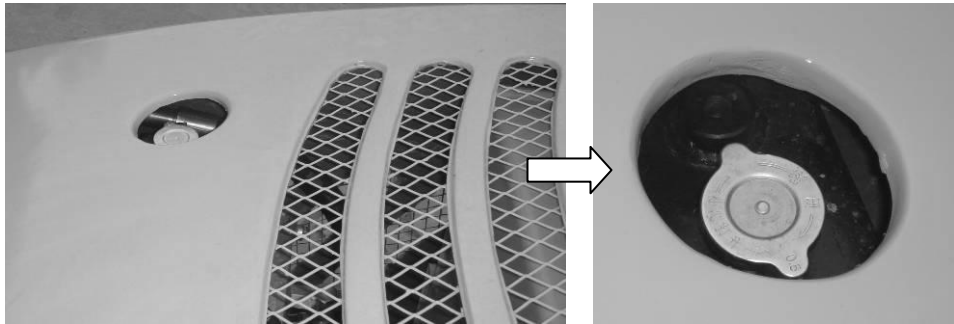
The engine coolant is mainly composed of the cooling water, anti-freezing fluid and additive and located in the radiator at the rear of the machine.



Checking Method of Coolant Level:

1. It is necessary to slowly unscrew the water-filling cover of the radiator to release the pressure after the engine coolant temperature dropped to 50°C below so as to avoid the burns by the high-temperature steam or coolant sprayed out.

Water-filling port of water radiator



2. Check whether the coolant level is within 1 cm under the water-filling port, and add the coolant if necessary.
3. Check the seal of water-filling cover of water radiator and replace it if damaged.
4. Screw down the water-filling cover of water radiator.

Caution: If the coolant should be added every day, it is necessary to check the engine's cooling system for leakage. If the leakage is found, it is necessary to eliminate the leakage and add the anti-freezing fluid to the appropriate level.

Check for Concentration of Anti-freezing Fluid

When adding the coolant to the new motor grader or the engine of which cooling system is rinsed, first it is necessary to choose the concentration of the anti-freezing fluid inside the coolant in accordance with local minimum temperature (under normal circumstances, the freezing point of the coolant should be 10°C above less than the minimum temperature of the area) and calculate the required amount of the anti-freezing fluid based on the total volume of the cooling system of engine, and then mix the anti-freezing fluid with the softened water to add into the cooling system. The total volume of the cooling system of the machine is about 45 liters (the actually added amount should be determined by checking whether the coolant level is within 1 cm under the water-filling port and add the coolant if necessary).

The brand and performance of the anti-freezing fluid recommended by Liugong Machinery Co., Ltd. are as follows:

Applicable Minimum Ambient Temperature	Shell Anti-freezing Fluid (Concentrated-OAT) (Percentage)	Mobil Anti-freezing Agent (Concentrated) (Percentage)
-45°C	55%	—
-30°C	47%	47%
-15°C	30%	33%
0°C	0	0

When replacing the anti-freezing fluid, please choose the high-quality anti-freezing fluid and add it under its instructions.

⚠ Caution: 1. Anti-freezing fluid is a flammable material, do not close to the open flame. 2. Be sure not to use the water independently as the coolant. It is prohibited to add the tap water or mineral water to the cooling system instead of the softened water. Otherwise it may lead to the corrosion of the whole cooling system.

Check for Concentration of Coolant Additive

Coolant should contain the additive (SCA). Additive can prevent the rust, scaling, pitting and corrosion of the engine parts contacting with the coolant. The concentration of coolant additive should be maintained at around 3%. Anti-freezing fluid already contains the additive, but the additive would be consumed during the use of engine, so it is necessary to check the concentration of additive once per 500 work hours or 6 months and add the additive regularly by replacing the coolant filter.

Refer to the “Operation and Maintenance Manual of Engine” for the further detailed provisions about the testing method for concentration of additive and the supplement of additive.

Add of Coolant



Operating coolant is of the higher pressure and temperature. The hot coolant can cause the serious burns, so if it is necessary to shut down the engine and wait for the radiator to cool down before opening the cover, and then slowly unscrew the water-filling cover in order to release the internal pressure.

Coolant-adding steps are as follows:

1. It is necessary to mix the water and anti-freezing fluid completely according to the selected ratio of coolant in advance.
2. Switch on the negative switch of power supply; insert the key into the starting switch and turn it clockwise to “ON” gear to switch on the power supply of complete vehicle.

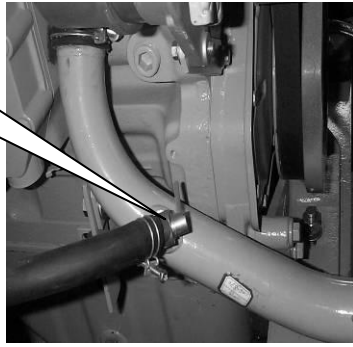


3. Turn the inverter switch of air-conditioning system to the heater gear.

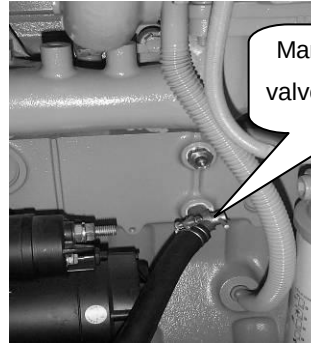


4. Turn the manual valve in the water-in pipe of engine to the access position.

Manual hot-water
valve (water
intake)



Manual hot-water
valve (water return)



5. Open the water-filling cover of water radiator to add the coolant slowly until the level is within the 1 cm under the water-filling cover of water radiator and remain stable for 10 minutes.

⚠ Caution: With the injection of coolant, it is important to exhaust the air from the cooling system pipeline of engine.

6. Keep the water-filling cover of water radiator open, start the engine to run at the low idle speed for 5 minutes first and run at the high idle speed for 5 minutes, and make the coolant temperature reach 80°C above.
7. Re-check the coolant level and, if necessary, add the coolant until the level is within 1 cm under the water-filling cover of water radiator.
8. Check the seal of water-filling cover of water radiator and replace it if damaged.



Do not add the cold coolant to the high-temperature engine; otherwise it could lead to the damage to the engine body. It is necessary to add the coolant after the engine temperature is below 50°C

Liugong Machinery Co., Ltd. will not hold responsibility for the losses due to the decline in the concentration of anti-freezing fluid as a result of the leakage of coolant caused by the improper operation of user.

Change of Coolant



When carrying out the check, maintenance, test and adjustment to the motor grader, it is necessary to be prepared to use a suitable container to collect the liquid before removing any hydraulic oil circuit or disassembling any part containing the liquid. And dispose of all liquid in accordance with the local laws and regulations.

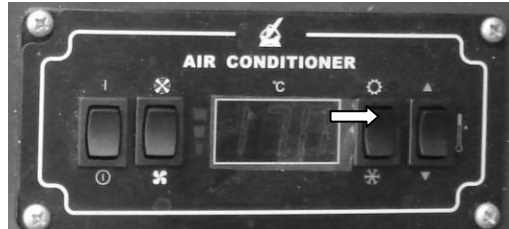
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It is necessary to change the coolant inside the cooling system and rinse the cooling system once every 2,000 work hours or a year (whichever comes first). Before it, if the coolant was

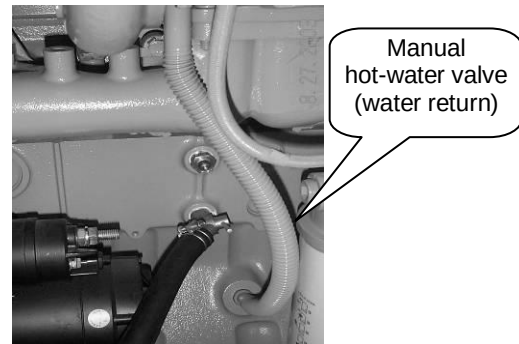
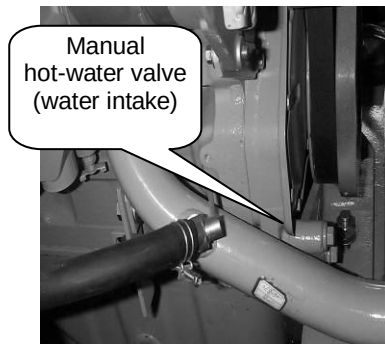
contaminated, engine was overheated or bubble appeared in the radiator, it is necessary to rinse the cooling system.

Operational steps of rinsing the cooling system are as follows:

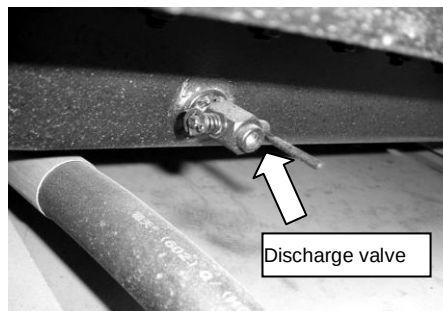
1. Switch on the negative switch of power supply; insert the key into the starting switch and turn it clockwise to “ON” gear to switch on the power supply of complete vehicle; turn the inverter switch of air-conditioning system to the heater gear.



2. Turn the manual valve in the water-in pipe of engine to the access position.



3. Open water-discharging valve at the bottom of the water radiator to discharge the coolant of engine and use the container to receive it.



4. After discharging the engine coolant, close the discharge valve at the bottom of the water radiator.
5. Check all the water pipes and clamps of cooling system for damage, if necessary, replace them. Check the water radiator for leakage, damage and the accumulation of filth and clean and repair it according to the needs.
6. Add the clean water to the cooling system of engine and appropriate amount of special cleaning fluid of the cooling system of engine (the concentration of cleaning fluid should be determined in accordance with the User's Guide).

⚠ Caution: 1. With the injection of coolant, it is important to exhaust the air from the cooling system pipeline of engine.
2. Throughout the cleaning process of cooling system, do not cover

the water-filling port of the water radiator when the engine is running.

7. Keep the water-filling cover of water radiator open, start the engine and run the engine for 5 minutes again when the coolant temperature reaches 80°C above.
8. Shut down the engine to discharge the cleaning fluid.
9. Add the clean water into the cooling system of engine to normal level and keep unchanged for 10 minutes. Keep the water-filling cover of water radiator open, start the engine and run the engine for 5 minutes again when the coolant temperature reaches 80°C above.
10. Shut down the engine to discharge the water inside the cooling system. If the discharged water is still dirty, it is necessary to rinse the system until the discharged water gets clean.
11. Replace the coolant filter and turn off all the discharge valves. And then add the new coolant in accordance with the aforementioned operational procedures of “Add of Coolant”.

⚠ Caution: Engine coolant is toxic and can not drink, please dispose of it in accordance with the relevant local law.

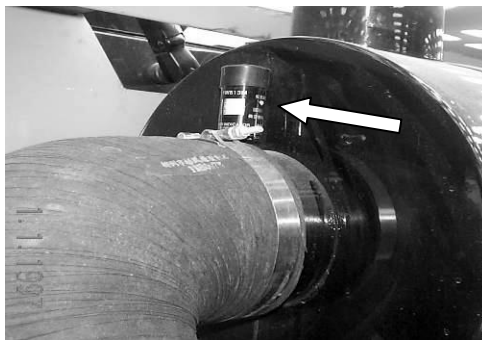
Maintenance for Air Filter of Engine

Air filter is located under the rear hood of motor grader.

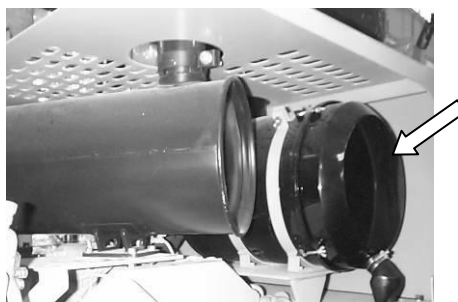


Clean of Air Filter

- ⚠ Caution:**
1. The air filter should be maintained if the blockage alarm lamp of air filter goes on.
 2. When maintaining the air filter, it is necessary to shut down the engine to prevent the damage to engine.



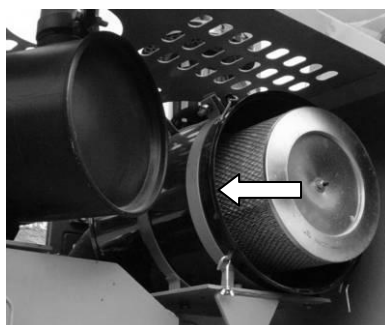
1. Shut down the engine and open the engine hood.
2. Open the cover of air filter.



3. Radially pull out the main filter core.

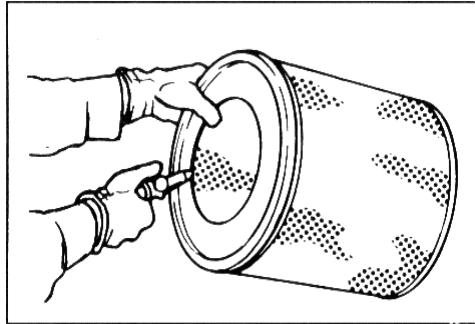


4. Clean the inner wall of air filter shell.



5. When cleaning the main filter core, use the compressed air with the pressure not more than 300KPa to wash out outwards from the inside of main filter core along the crease and then wash out repeatedly from the inside and outside of the main filter core respectively along the crease.

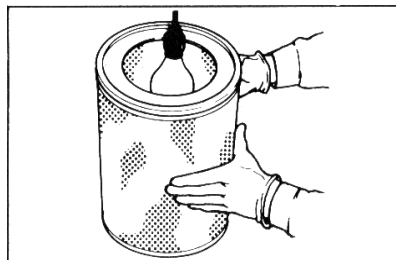
Clean of Main Filter Core



Caution: It is prohibited to beat when cleaning the main filter core; otherwise it may cause the damage to engine.

6. After cleaning the main filter core, it should be check with lamp, and if the small holes or particles and the damage to washer or seal are found, it is necessary to replace the main filter core.

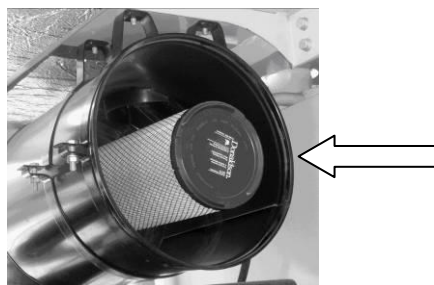
Check of Main Filter Core



7. Mount the clean main filter core inside the air filter shell and ensure the uniform contact of end position of main filter core.
8. Clean and mount the air filter cover and ensure the uniform contact between the packing plate of inner cover of air filter and the air filter shell.
9. After cleaning the main filter core, start the engine; if the blockage alarm lamp of air filter still flashes or still emits the black smoke, it is necessary to replace with a new safety filter core.
10. The main filter core should be replaced after being cleaned 6 times, even if it has not been cleaned for 6 times, it still should be replace once a year. When replacing the main filter core, the safety filter core should be replaced at the same time.

Replacement of Safety Filter Core of Air Filter

Safety filter core



Caution: The safety filter core can only be replaced with new one and not be

cleaned for using again.

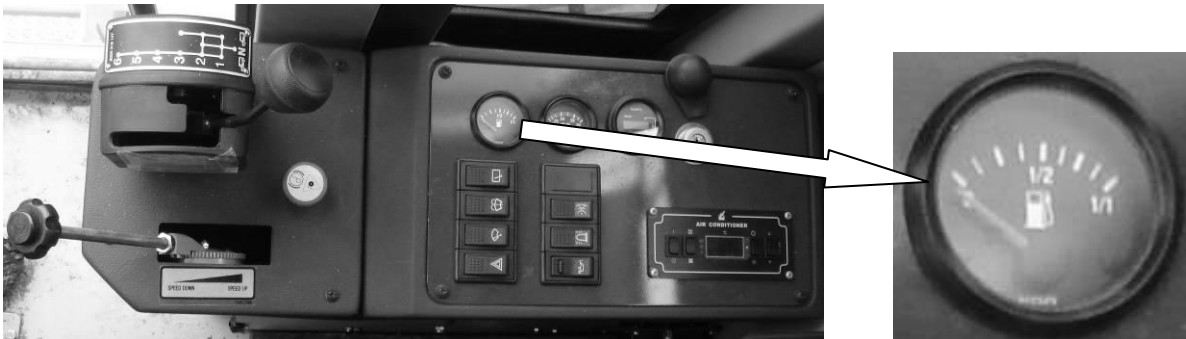
1. Shut down the engine and open the engine hood.
2. Open the cover of air filter.
3. Remove the main filter core.
4. Remove the safety filter core.
5. Clean the inner wall of air filter.
6. Mount the new safety filter core and ensure the uniform contact and good seal of seal ring on the end surface of the safety filter core.
7. Mount the main filter core and the cover of air filter.

Caution: 1. When replacing the main filter core, the safety filter core should be replaced at the same time. 2. After cleaning the main filter core, start the engine; if the blockage alarm lamp of air filter still flashes or still emits the black smoke, it is necessary to replace with a new safety filter core.

Maintenance of Fuel System of Engine

Check of Fuel Level

The fuel level gauge of this machine is located on the functional panel at the right of seat.



Fuel level gauge indicates the fuel level of the complete machine and when the fuel gauge indicates “1/1”, the fuel level is the highest and when it indicates “0”, the fuel level is the lowest. When the fuel gauge indicates the 2nd lattice at the left, it is necessary to add the fuel timely.

Add of Fuel

The fuel tank of the motor grader is located at the central rear of the complete machine with the volume of 230 liters.



1. The filler of diesel tank is located at the top of engine hood.

Filler



2. When opening the cover of filler, first erect the locking plate of the cover, and rotate the cover anti-clockwise to the next locking position, and then move the cover outwards.
3. Take off the cover of filler and then add the fuel.

⚠ Caution: Do not take off the filter screen of filler when adding the fuel.

Rinse of Fuel Tank

⚠ Caution: When carrying out the check, maintenance, test and adjustment to the motor grader, it is necessary to be prepared to use a suitable container to collect the liquid before removing any hydraulic oil circuit or disassembling any part containing the liquid. And dispose of all liquid in accordance with the local laws and regulations.

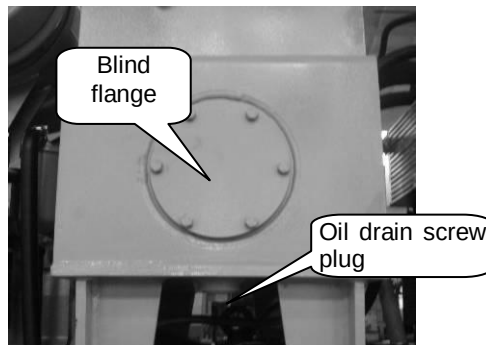
The fuel tank is located in the central rear of the complete machine and the filter screen of filler and fuel tank should be rinsed regularly.



Fuel tank could be rinsed according to the following methods:

1. Remove the blind flange in the front of fuel tank and rinse the inner surface of fuel tank with the clean fuel.

Rinse of fuel tank



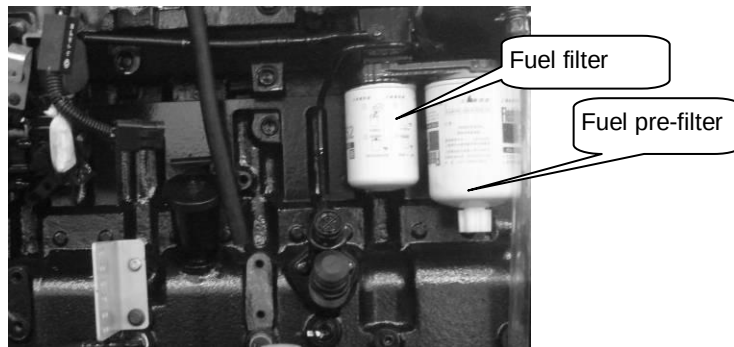
2. Unscrew the oil drain screw plug under the fuel tank to drain the fuel.
3. Rinse it repeatedly until the drained fuel is clean.

Removal of Water and Impurity from Fuel

In case of the water and impurity in the fuel, fuel pump and nozzle will be unable to operate normally and the abrasion will speed up. Measures should be taken to eliminate the water and impurity from the fuel. Methods are as follows:

1. If the conditions allow, the fuel should get through with 24-hour precipitation before being added into the fuel tank.
2. Before the refueling, unscrew the oil drain screw plug at the bottom of the fuel tank once a week to discharge the water and impurity.
3. Everyday, after the end of the work, fill the fuel tank fully and exhaust the wet air from the fuel tank.
4. After filling the fuel tank fully, the engine should be started after 5-10 minutes in order to make the water and impurity in the fuel deposit at the bottom of the fuel tank.

5. After the operation everyday, unscrew the oil drain plug at the bottom of fuel pre-filter, fuel filter (primary filter, secondary filter) to discharge the water and impurity.



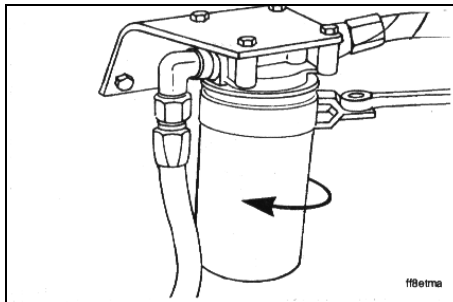
Caution: Do not wait for adding the fuel until the fuel of tank run out, this will lead to the shutdown of the engine and the fuel at the bottom of the fuel tank contains more water and impurities will affect the normal operation of the engine.

Replacement of Fuel Filter

Caution: Do not inject the fuel before mounting the fuel filter. Fuel pollution will accelerate the wear and tear of the fuel system parts.

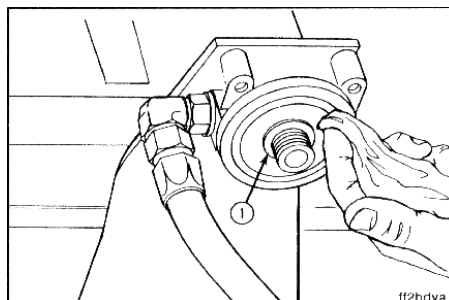
1. First of all, clean the surrounding areas of filters (primary filter, secondary filter) and the mounting seat.
2. Remove the filter from the mounting seat with the belt spanner.

Removal of filter



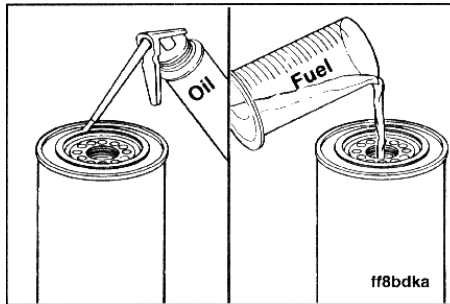
3. Take off the packing plate ① on the thread joint of the mounting seat. Clean the sealing surface of mounting seat with fiber-free cloth.

Clean of sealing surface of mounting seat



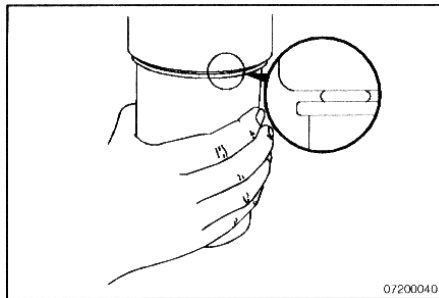
4. Mount a new packing plate on the thread joint of the mounting seat of filter; supply a layer of engine oil on the sealing surface of the filter; fill the filter with the clean fuel.

Prepare for new filter



5. Mount the filter to the mounting seat with hands and tighten it for 1/2 to 3/4 laps when the packing plate of filter contacts the mounting seat. It is prohibited to tighten it mechanically to avoid the damage to the filter.

Mount of filter



Replacement of Fuel Prefilter

1. First of all, clean the surrounding areas of prefilter and the mounting seat.
2. Remove the prefilter from the mounting seat and clean the sealing surface of mounting seat with fiber-free cloth.
3. Remove the transparent water cup from the lower part of fuel prefilter.
4. Clean the water cup and then mount it to the new fuel prefilter.
5. Fill the fuel prefilter with the fuel and apply a layer of engine oil on the packing plate, and then mount it to the mounting seat.

Heating of Fuel

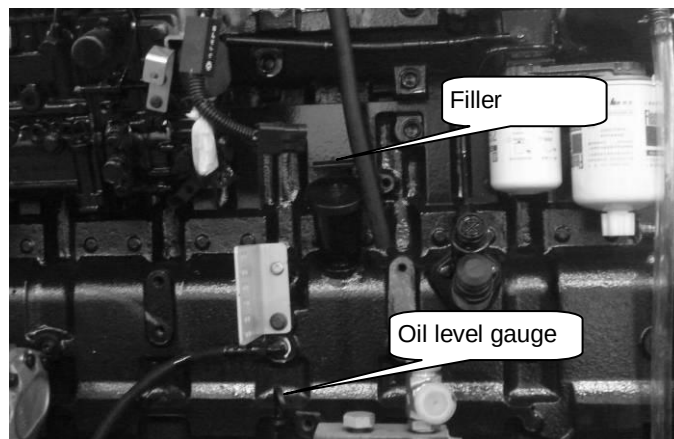
If the fuel should be heated due to the lower temperature, fuel temperature should not exceed 35°C, otherwise engine power would be lost.

Maintenance of Engine Oil

Check of Engine Oil Level

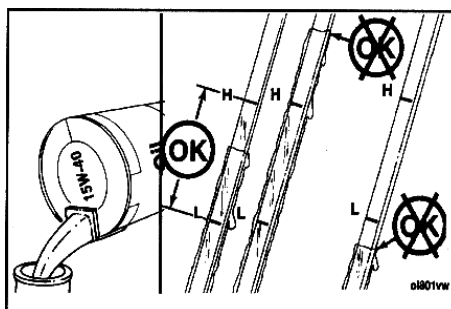
⚠ Caution: Excessive or insufficient engine oil will cause the damage to the engine.

1. Drive the motor grader to the flat ground, shut down the engine and implement the parking brake.
2. After shutting down the engine, wait 10 minutes for the engine oil inside the crankcase flowing back to the engine oil disc.
3. Open the engine hood and the filler and oil level gauge are all located at the right side of engine.



4. Unscrew and pull out the oil level gauge, wipe the oil level gauge with a clean cloth, re-insert the engine oil level gauge to the end, and then pull it out for checking that the oil level should be between the “L” scale and “H” scale of the oil level gauge.

Reasonable oil level range

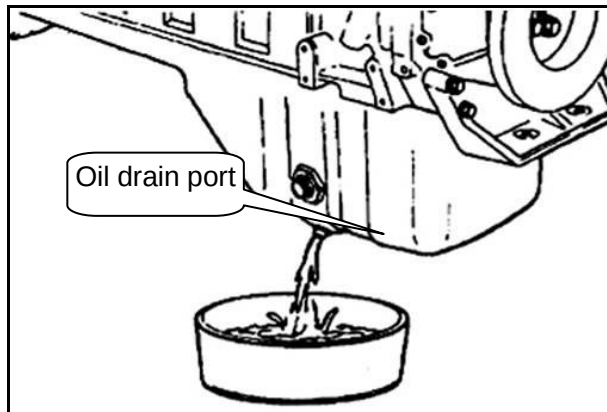


5. If the oil level is below the “L” scale, please add the oil; if the oil level is over the “H” scale, please unscrew the oil drain screw plug at the bottom of the engine oil disc to discharge a part of the engine oil.

Change of Engine Oil

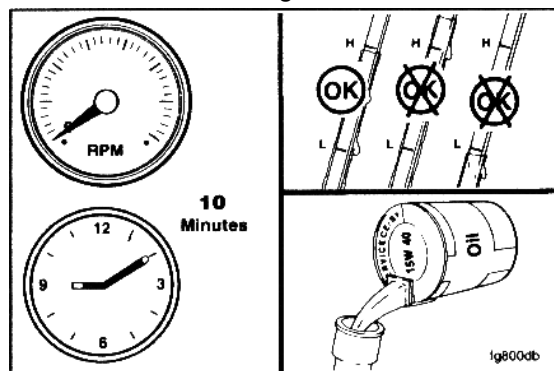
⚠ Caution: When carrying out the check, maintenance, test and adjustment to the motor grader, it is necessary to be prepared to use a suitable container to collect the liquid before removing any hydraulic oil circuit or disassembling any part containing the liquid. And dispose of all liquid in accordance with the local laws and regulations.

1. Park the motor grader on a flat ground and run the engine until the water temperature reaches 60°C
2. Shut down the engine and implement the parking brake.
3. Oil drain bolt of engine oil is located at the left side of rear frame. Release the oil drain port of engine oil to discharge the oil into the proper container.



4. Screw down the oil drain bolt. And then add the clean engine oil from the filler to the “H” scale of oil level gauge. Run the engine at the idle speed and check the engine oil filter and oil drain bolt for leakage.
5. Shut down the engine, wait 10 minutes for the engine oil flowing back to the engine oil disc and re-check the engine oil level, and if the engine oil is insufficient, please add the engine oil to the “H” scale of engine oil level gauge.

Check of Engine Oil Level



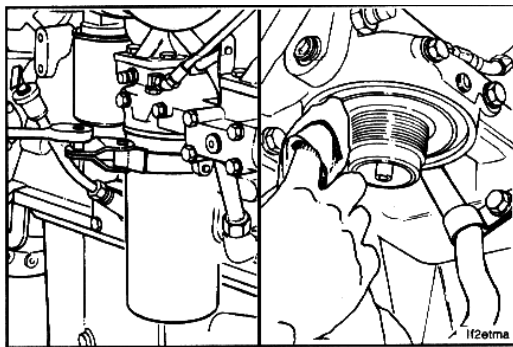
⚠ Caution: When opening the electric lock but not starting the engine, engine oil pressure alarm and buzzer will give an alarm until the engine is started

successfully and engine oil pressure gets into the normally operating scope. If the alarm continues give an alarm, please shut down the engine immediately and check whether the engine oil level is at the right position in order to avoid the damage to the engine.

Replacement of Engine Oil Filter

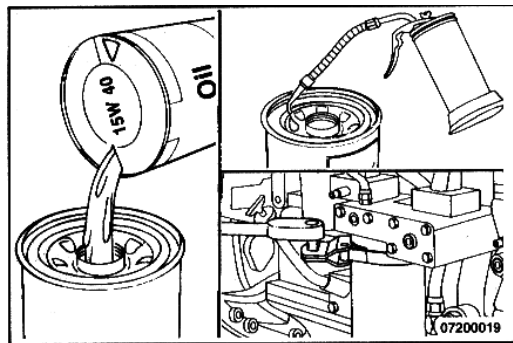
1. Clean the surrounding area of the mounting seat of the oil filter.
2. Remove the engine oil filter with the belt spanner.
3. Clean the contacting surface of packing plate on the mounting seat with a clean cloth. If the oil O-type seal ring is stuck on the mounting seat, remove it.

Clean of mounting seat



4. Mount a new O-type seal ring, fill the engine oil filter with the clean oil and supply a layer of clean engine oil on the surface of the packing plate.

Mount of new engine oil filter



Caution: Before the mount, fill the engine oil filter with the clean oil. In case of mounting an empty oil filter, engine will break down due to the lack of lubricating oil.

5. Mount the oil filter to the mounting seat, tighten it by hand until the surface of the packing plate of oil filter contacts with the mounting seat, and then use the belt spanner to screw down the oil filter to the required value.

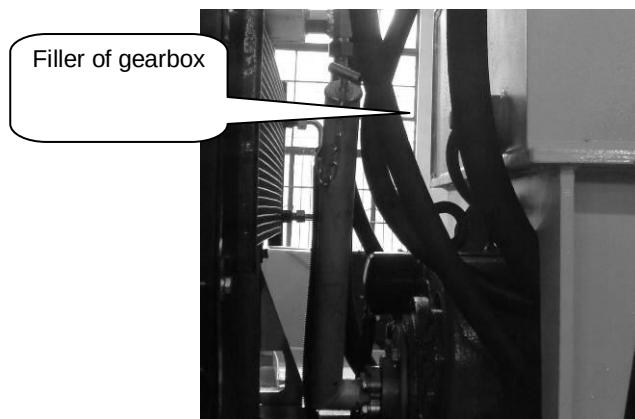
Caution: Excessively mechanical tighten may cause the damage to the thread or the seal of core of the engine oil filter.

Maintenance of Gearbox

Check of Oil Level of Gearbox

⚠ Caution: When checking the oil level, it is necessary to park the motor grader on the flat ground, place the gear-control handle at the neutral gear and press down the button of parking brake to implement the parking brake. Mount the fixed bumper of the frame to prevent the movement and rotation of the machine.

Gearbox is located under the fuel tank, the filler of gearbox is located between the radiator and fuel tank and the oil gauge for checking the oil level is mounted inside the oil filling pipe.

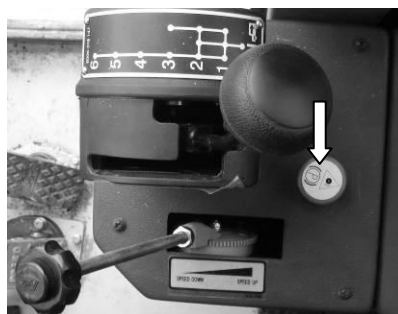


Caution:

1. When checking the oil level of gearbox, it is necessary to check the cold oil level and hot oil level respectively.
2. Too high or low oil level of gearbox may lead to the damage to the gearbox, so the oil level of gearbox should be remained in the correct position.

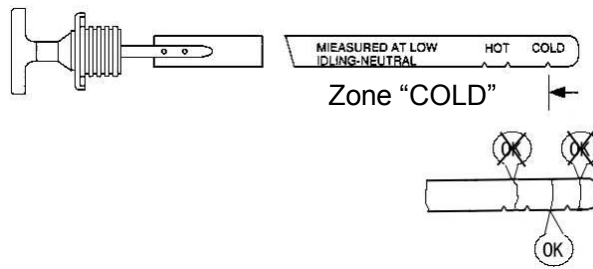
Gearbox oil level should be checked as follows:

1. Park the motor grader on the flat ground.
2. Place the gear control handle at the neutral gear “N” and press down the button of parking brake to implement the parking brake in order to prevent the motion of machine.

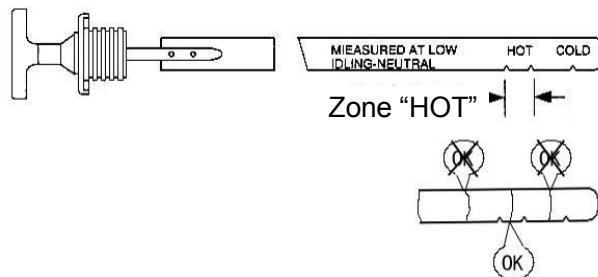


3. It is necessary to check the cold oil level when the engine is running idly and the oil temperature does not exceed 40°C by unscrewing the oil level gauge anti-clockwise to take off

it and wipe out oil on it with a clean cloth and insert it into the oil filling pipe till the end, and then pull out the oil level gauge. At this time the oil level should be within the “COLD” oil zone of the oil level gauge (see the following figure).



4. When the oil temperature reaches the operating value (80°C~90°C), check the hot oil level. Take off the oil level gauge and wipe out oil on it with a clean cloth and insert it into the oil filling pipe till the end, and then pull it out. At this time the oil level should be within the “HOT” oil zone of the oil level gauge (see the above figure). If the oil level is over the “HOT” zone, discharge a part of the gearbox oil through the oil drain screw plug at the bottom of the gearbox.

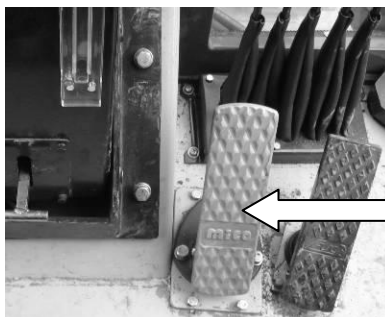


5. After the check, insert the oil level gauge into the oil filling pipe of gearbox, and then rotate it clockwise to screw down the oil level gauge.

Caution: When checking the oil level of gearbox, changing the gearbox oil and replacing the oil filter of gearbox, be sure to keep clean to prevent the filth from entering the gearbox system so as to avoid the damage to the gearbox.

When checking the hot oil level of the gearbox, the operation methods to rapidly increase the oil temperature are as follows:

1. Park the motor grader on the flat ground and it is necessary to ensure that there is a body-length space in the front and rear of the machine and there are no people around the machine.
2. Place the gear control handle to the neutral gear “N” and pull up the button for parking brake to release the parking brake.
3. Step on the service brake pedal to the end.



4. Place the gear control handle to the forward 6th gear, at this time, the torque converter is in the stall working condition and the oil temperature of gearbox will rise rapidly.
5. When the oil temperature of gearbox reaches above 80°C, place the gear control handle to the neutral gear and pull up the electromagnetic valve switch of parking brake. At this point the hot oil level of gearbox can be checked.

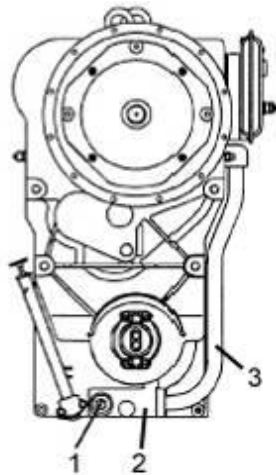
Change of Gearbox Oil

After the first 100 work hours, it is necessary to change the gearbox oil, and change it once every 1,000 work hours afterwards. Change the gearbox oil once a year at least.

⚠ Caution: When carrying out the check, maintenance, test and adjustment to the motor grader, it is necessary to be prepared to use a suitable container to collect the liquid before removing any hydraulic oil circuit or disassembling any part containing the liquid. And dispose of all liquid in accordance with the local laws and regulations.

The gearbox oil should be changed according to the following steps:

1. Park the motor grader on the flat ground, place the gear control handle at the neutral gear and press down the button of parking brake to prevent the movement and rotation of machine.
2. Start the engine and run it at idle speed and shut down the engine when the oil temperature of gearbox reaches the operating value (80°C-90°C).
3. Screw off the oil drain screw plug ① at the lower rear of gearbox to discharge the oil and receive it with a container.

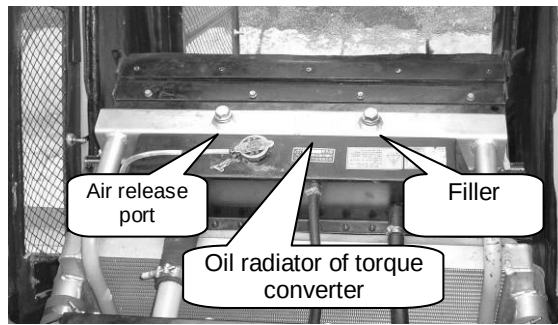


1. Oil drain screw plug
2. Primary filter of gearbox
3. Oil suction pipe

⚠ Caution: At this time oil temperature of gearbox is still high, so it is necessary to wear the protective equipment and operate carefully so as not to cause physical harm.

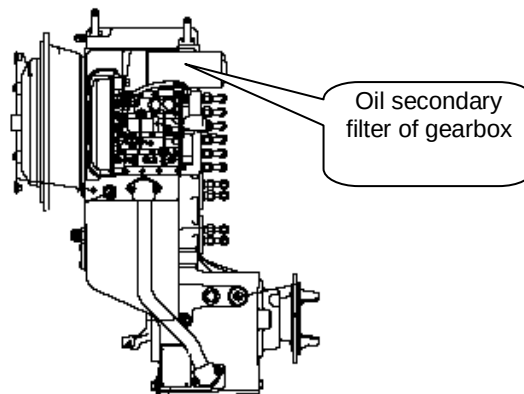
4. Screw off the oil drain screw plug at the lower of the oil radiator of torque converter to discharge the oil and receive it with a container and then screw off the air release screw plug at the top of the oil radiator of torque converter to speed up the oil drain.

Oil radiator of torque converter

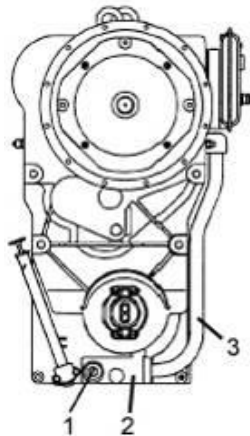


Caution: When draining the oil, it is necessary not only to drain the gearbox oil and also the oil of torque converter and radiator.

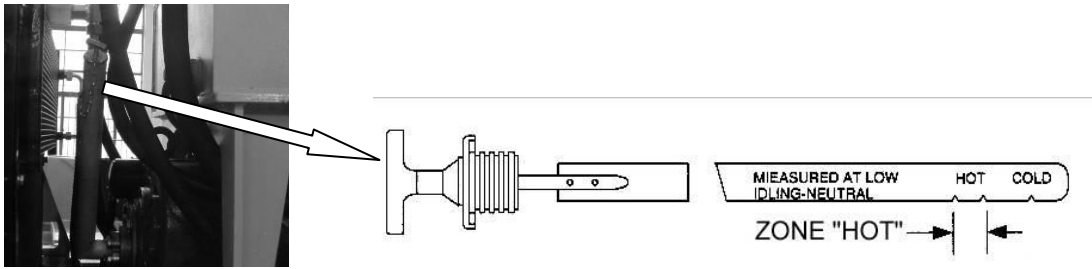
5. Replace the oil secondary filters of gearbox.



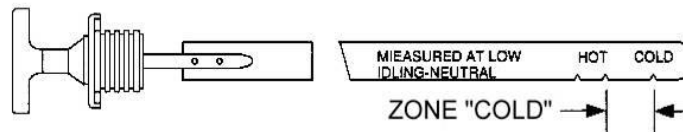
6. Remove the oil suction pipe ③ at the right rear of gearbox to take off the primary filter ② Rinse and dry it with the clean compressed air or fuel.



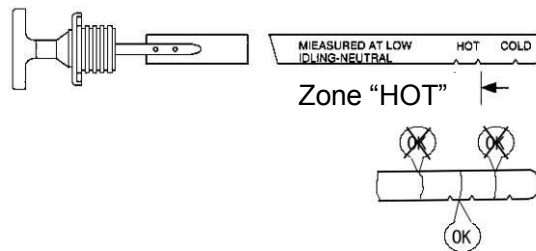
7. Remove the iron dust attached on the oil drain screw plug with the magnet and remove the iron dust of inner wall by stretching the magnet through the mounting port of secondary filter into the oil disc of gearbox.
8. Mount the primary filter, oil suction pipe, oil drain screw plug, oil drain screw plug under the radiator of torque converter and its sealing pieces.
9. Unscrew the oil filling screw plug in the top of radiator of the torque converter and add the clean gearbox oil from the filler of the radiator of torque converter, and then screw down the air release screw plug and oil filling screw plug after the radiator is full of the gearbox oil.
10. Take out the oil level gauge of gearbox and add the clean gearbox oil from the oil filling pipe of gearbox until the oil level reaches above the "HOT" zone.



11. Start the engine and run it at the idle speed, at the same time check the oil level and add the gearbox oil repeatedly until the oil level reaches above the “COLD” zone of oil level gauge. During this process, the gearbox is likely to produce a slight abnormal sound, which is caused by the lack of gearbox oil, and adding the oil to the specified level will eliminate the abnormal sound.



12. When the gearbox oil reaches the operating temperature (80°C~90°C), check the oil level once again, and the oil level should be within the “HOT” zone of oil level gauge. In case of the oil shortage, please add the oil; in case of excessive oil, please drain some of the oil.

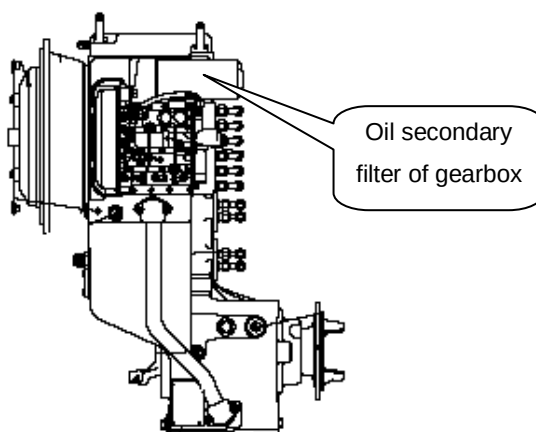


13. Insert the oil level gauge and tighten it clockwise.

Caution: Before changing the gearbox oil, be sure to cover the parking brake to avoid the friction plate of parking brake stained with the oil to reduce the brake performance.

Replacement of Secondary Filter of Gearbox Oil

The secondary filter of gearbox oil is located at the right top of the gearbox and should be replaced when changing the gearbox oil.



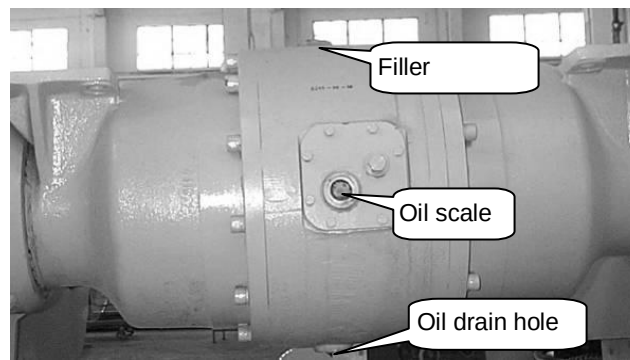
1. Clean the surrounding area of secondary filter of gearbox.
2. Remove the secondary filter from the mounting seat with the belt spanner.
3. Clean the sealing surface of mounting seat with a clean cloth.
4. Apply a layer of gearbox oil on the packing plate of new secondary filter.
5. Tighten the secondary filter on the mounting seat until the packing plate of secondary filter contacts with the sealing surface of the mounting seat and then screw it down for 1/3 to 1/2 laps by hand.

Maintenance of Driving Axle

Oil Level of Driving Axle—Check

⚠ Caution: take care when unscrewing the plug to take oil in or out driving axle, in case of hot oil splash.

6. Drive the machine to a flat field and park it horizontally! Clean all the filling parts up before check!
7. Put the shifting control handle in neutral gear, and press down the parking brake button in case of vehicle moving.
8. Observe the oil scale in the middle of driving axle, and you shall find the oil level in the middle of oil scale, otherwise the oil volume is not enough.



Oil of Driving Axle—Replacement

⚠ Caution: 1. During the check, maintenance, test and adjustment of machine, when removing any hydraulic circuits or taking down any parts containing liquids, you must prepare a proper container to collect the liquids and then dispose all the liquids according to the local code and regulation.

2. It should be conducted to drain oil after driving for a time so as to fully suspend the precipitated impurity in the axle housing.

- 1 Put the shifting control handle in neutral gear, and draw up the parking brake button.
- 2 If the vehicle stops on a slope, the wheels must be wedged.
- 3 Unscrew the drain plug in the middle of rear driving axle to drain the oil, and collect the oil in a container.

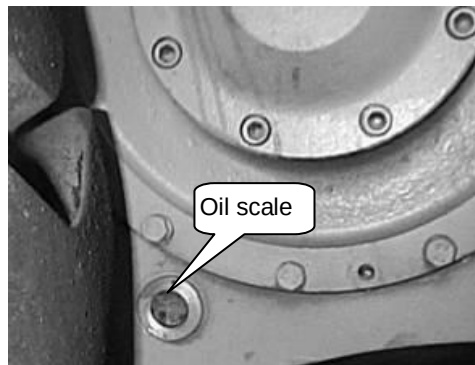
⚠ Warning: as the oil temperature maybe high, you should wear safety appliances and operate carefully, in case of body injuries.

- 4 Screw up the drain plug in the middle of rear driving axle.
- 5 Filling in clean gear oil through the filler of rear driving axle until the oil level is in the middle of oil scale.
- 6 After ten minutes, if the oil level keeps the same, you can screw up the choke plug of the filler of rear driving axle.

Maintenance of Tandem

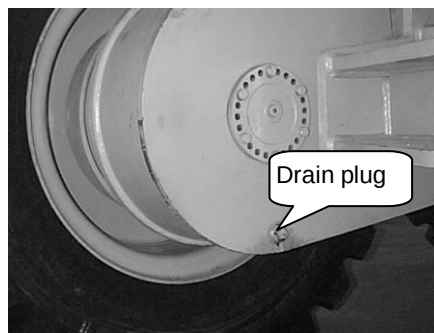
Checking the Oil Level of Tandem

Drive the machine to a flat field. Observe the oil scales separately in the middle of left and right wheels, and you should find the oil level in the middle of oil scale, otherwise the oil volume is not enough.



Replacement of Tandem Oil

1. Put the shifting control handle in neutral gear, and press down the parking brake.
2. If the vehicle stops on a slope, the wheels must be wedged.
3. Unscrew the drain plug at the inner side of tandem to drain the oil, and collect the oil in a container.



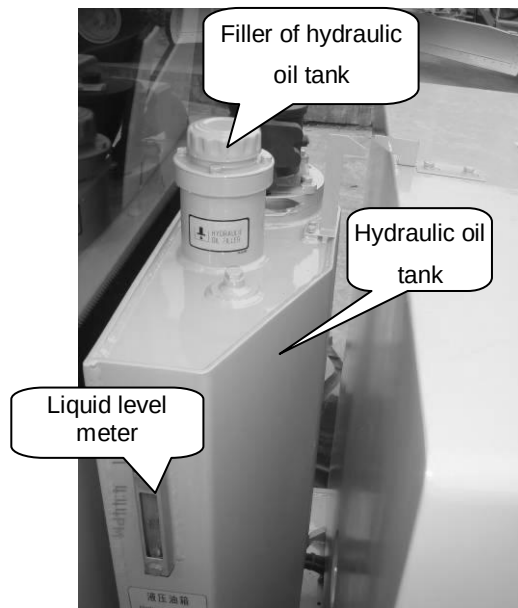
4. Screw up the drain plug after the oil is completely discharged.
5. Filling in the clean gear oil through the filler of tandem until the oil level is in the middle of oil scale.
6. After ten minutes, if the oil level keeps the same, you can screw up the choke plug of the filler of rear driving axle.



Maintenance of Hydraulic System

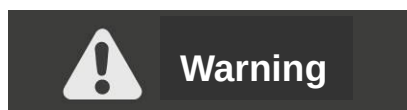
Checking the Level of Hydraulic Oil

⚠ Caution: when checking the level of hydraulic oil, you should park the vehicle in a flat field, put the working devices like moldboard on the ground and ensure to align the front and rear frames without angle.



The hydraulic oil tank locates at the back of cab. At the left side of hydraulic oil tank is a liquid level meter to indicate the level of hydraulic oil. At this moment, the level of hydraulic oil should be at 2/3 scale of liquid level meter.

Regular Replacement of Hydraulic Oil



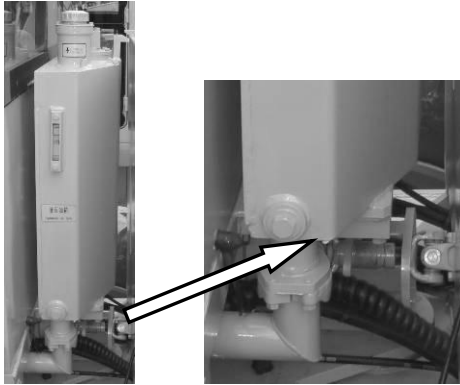
1. During the check, maintenance, test and adjustment of machine, when removing any hydraulic circuits or taking down any parts containing liquids, you must prepare a proper container to collect the liquids and then dispose of all the liquids according to the local code and regulation.
 2. During the operation of replacing the oil, you should be very careful of the cleanliness of hydraulic oil and do not let any dirt into the hydraulic system.
 3. If the hydraulic oil is seriously polluted and goes bad (like the color turns black) because of bad working condition, please replace the hydraulic oil in time.
- 1 Drive the machine to a flat field, press down the parking brake button, and fit on the fixed bumper of frame.
 - 2 Start the engine and run it for 10 minutes at idle speed, during when repeat the movements like raising and declining the boom and tipping the moldboard forward and backward.
 - 3 At last, lift the boom to the top position, tip the moldboard backward to the biggest position,

and then shut down the engine.

4 First shift the switch of shut-off valve of oil guide to the “OFF” gear.

5 Clean the oil drain hole beneath the hydraulic oil tank, unscrew the drain plug to discharge the hydraulic oil, and collect it with container. Meanwhile open the filler cap with lock of hydraulic oil tank to speed up oil discharging process.

Oil drain hole of hydraulic oil tank



Filler cap of hydraulic oil tank



⚠ Warning: as the oil temperature maybe high, you should wear safety appliances and operate carefully, in case of body injuries.

6 Take apart the oil-in pipe of hydraulic oil radiator, and drain the residual hydraulic oil of the radiator.

7 Take down the top cover of oil return filter of hydraulic oil from hydraulic oil tank, take off the oil return filter core and replace it with a new one. Open the filler cap and take off the filter screen of filler to clean.

Oil return filter



8 Take down the flange cover of cleaning mouth of oil tank beneath the filler, wash the bottom and four walls of the hydraulic oil tank with fuel, and dry it with clean cloth at last.

9 Mount the drain plug of hydraulic oil tank, oil return filter and top cover, filter screen of filler, flange cover of cleaning mouth of oil tank and hydraulic oil radiator well.

10 Fill in clean hydraulic oil through the filler of hydraulic oil tank to make the oil level reach the upper scale of liquid level meter of hydraulic oil, and then screw up the filler cap.

11 Remove the fixed bumper of frame and start the engine. First shift the switch of shut-off valve of oil guide to the “ON” gear. And then operate the control handle of leading valve to conduct the movements of raising and declining the boom, tipping the moldboard forward and backward, and turning left and right to the largest angle for 2~3 times, in order to fill the oil tank and oil pipe with hydraulic oil. Afterwards run the engine at idle speed for 5 minutes to exhaust the air in the system.

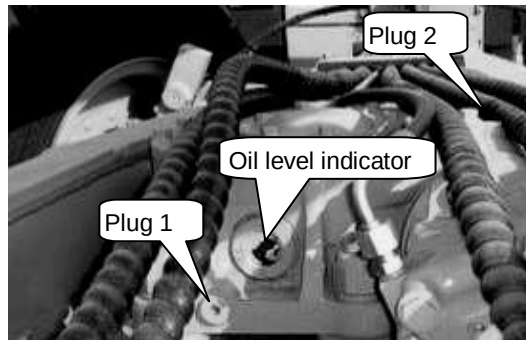
12 Shut down the engine, open the filler cap of hydraulic oil tank, and add clean hydraulic oil until

the level of hydraulic oil reaching the 2/3 scale of liquid level meter of hydraulic oil tank.

Maintenance of Working Device

Oil Level of Worm-gear Case—Check

1. Put the worm-gear case horizontally.
2. Observe the oil level indicator, and the oil level must in the middle of observing hole.
3. Add oil through filler (plug 2) first, if necessary.
4. Normally, you should check the oil level after 50h's continuous work of the machine.

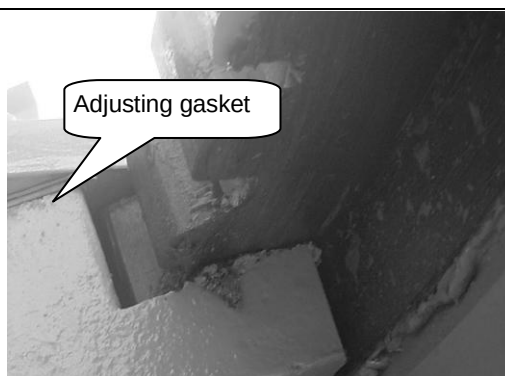


Worm-gear Case—Oil Replacement

1. In order to speed up oil discharging, swing the moldboard to lean at the drain plug (plug 1) side and bear the moldboard on the ground.
2. Take off plug 1, and then you can drain the oil. If taking off plug 2 at the same time, you can pick up the draining speed and make the oil discharged completely.
3. Clean plug 1, and exchange a new sealing ring. Mount the sealing ring at the worm-gear case (plug 1) and screw it up.
4. Lift and decline the oil cylinder with moldboard to put the worm-gear case horizontal again.
5. Fill the oil again through the filler (plug 2) to make the oil in the middle of the observing hole of oil level indicator. The oil volume is about 2.5L. Grease is 85W/90 GL-5 (in summer) or 80W/90 GL-5 (in winter).
6. Clean plug 2, and exchange a new sealing ring. Mount the sealing ring at (plug 2) and screw it up.
7. Guarantee to replace oil at once each year.

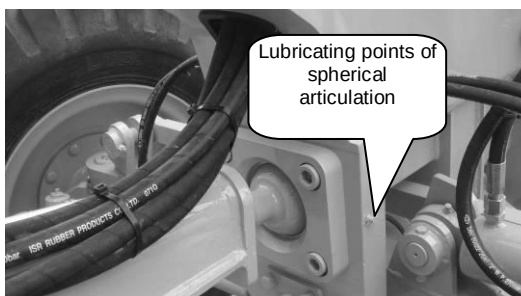
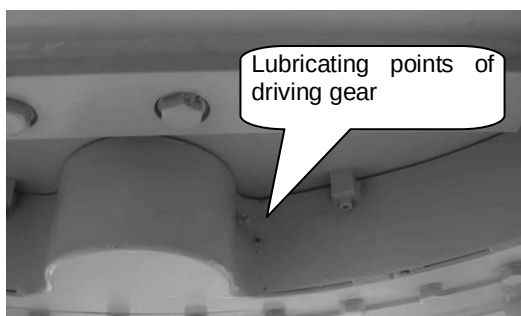
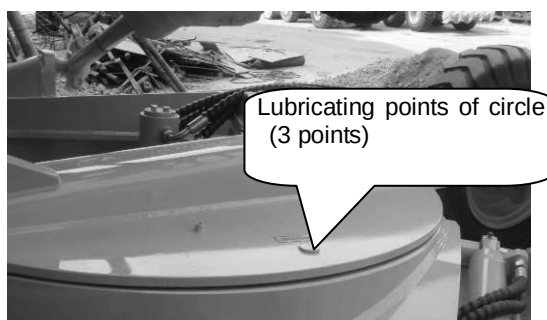
Adjustment of Circle Clearance

5. In order to ensure reliable working requirements, when assembling the working devices, you can choose the adjusting gasket with proper thickness which is mounted between traction frame and circle, and adjust the assembling clearance to 0.2~0.5 mm. The abrasion limit during work should be no more than 1mm. The worn-out gasket should be replaced in time.
6. After 500h of overall work, you should check the abrasion situation of adjusting gasket and the clearance between traction frame and circle.



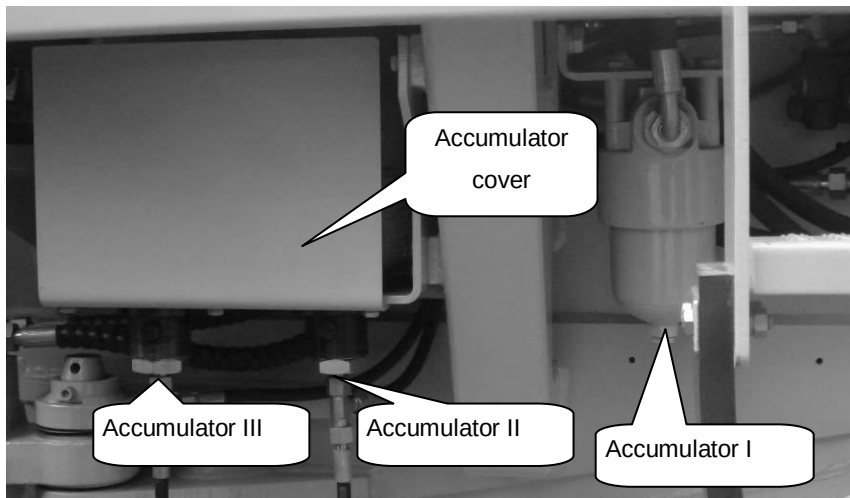
Circle-Lubrication

7. The lubricating grease filled by the factory is 3# lithium base lubricating grease. When the machine is working at low temperature, you can fill 2# lithium base lubricating grease. If it falls short of the working condition, you can change for proper lubricating oil.
8. If you find abnormal sound at the turning part or continuous increase of turning drive power during usage, you shall find out the reason, and remove and check it, if necessary.
9. Fill lubricating grease for circle, driving gear and each ball socket after every 100h's work or after every two weeks.



Maintenance of Accumulator

The accumulators (3) used by the brake system of this machine are mounted at the right side of frame, beneath the cab. Accumulator I is used for parking and emergency brake circuit. Accumulator II, III which beneath accumulator I are used for service brake circuit.



Checking the Pressure of Precharged Nitrogen of Accumulator

- ⚠ Caution:** 1. Accumulator should be checked by the pressure of precharged nitrogen of accumulator according to the stated cycle of “periodical maintenance”, to ensure the normal work of service brake system and parking brake system.
2. Check of the pressure of precharged nitrogen of accumulator should be conducted with special tools and by specially trained people.

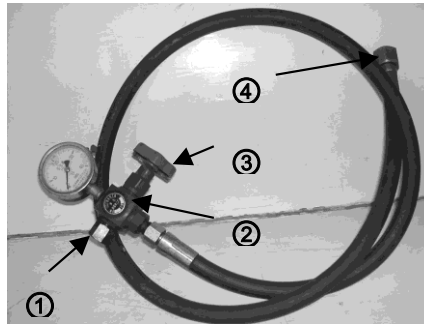
The operation steps are as follows:

- 1 Stop the machine in a flat and clear field with working devices like moldboard horizontal on the ground. Put the shifting control handle in neutral gear, and shut down the engine. Then turn the start switch clockwise to the first gear, and electrify it.
- 2 Releasing the pressure of accumulator: stamp on the brake pedal continuously for 20 times or so, and then continuously press down and pull up parking brake button for 20 times or so, in order to discharge the hydraulic oil in the accumulator. Afterwards slowly loose the drain plug at the oil-out opening beneath the accumulator to drain the remained hydraulic oil in the accumulator.



⚠ Caution: don't splash the hydraulic oil on the people during operation.

- 3 Remove the protecting cap of charge valve from the upper end of accumulator.
- 4 Connect the charging tool with the end of nitrogen cylinder and block it by plug. Connect the other end of pressure gauge with the charge valve at the upper end of accumulator.



1. connecting to the charge valve of accumulator 2. release port 3. switch 4. connecting to nitrogen cylinder
- 5 Turn on the switch of charging tool, and the thimble of it will push the charge valve of accumulator open. At this moment the indicating needle of pressure gauge shall indicate the reading. When the indicating needle becomes stable, whose reading is the pressure of precharged nitrogen in accumulator. The value should conform with:
Accumulator I——9.2MPa;
Accumulator II, III——9.2MPa
- 6 If the pressure is too low, the nitrogen should be complemented.
- 7 Turn off the switch of charging tool, and then remove it from the accumulator and mount the protecting cap of charge valve.

Pressure Relief of Accumulator

If the pressure of precharged nitrogen is above the respecting value, you can decompress it to the required pressure value by the air releasing end cap. It is suggested to slowly decompress it. It will need several minutes after depression to read the effective pressure value.

Charge of Accumulator

⚠ Caution: 1. If the pressure of precharged nitrogen of accumulator is insufficient, it should be complemented in time, otherwise it will affect the normal usage of brake system.
2. Check of the pressure of precharged nitrogen of accumulator should be conducted with special tools and by specially trained people.

The operation steps are as follows:

1. Connect the end of charging tool with pressure gauge to the charge valve at the upper end of accumulator, and the other end with nitrogen cylinder.
2. Slowly open the valve on the nitrogen cylinder. Wait until the pressure reading of pressure gauge becomes stable, and then slowly turn on the switch of charging tool. At this moment, the charge valve inside accumulator will be pushed open and the air charging starts. Keep charging until the pressure indicated by pressure gauge is a little higher than the required one, and then close the valve.

3. Pressure can be reached in a short time. You should turn off the switch of nitrogen cylinder, and check whether the pressure reaches or not after the pressure gauge is stable. If not, recharge it. If the pressure is too high, it may be depressed to the suitable value by bleeding the air through the air releasing end cap of charging tool. When the pressure is charged enough, first turn off the switch of nitrogen cylinder, and then turn off the switch of charging tool. Take off the charging tool.
4. Check whether the charge valve is leaking by suds. If there is air bubble, it is leaking. Slightly knock on the charge valve inside accumulator by hammer or small screwdriver to make it first drop a little and then return rapidly. It is all right when the sealing faces completely touch together.
5. Screw up the protecting cap of charge valve of accumulator again.



Warning

During the operation of removing the protecting cap of charge valve, it is forbidden to turn the steering wheel. Make sure the engine is shut down, in case of body injuries.

The accumulator can only be charged fully with nitrogen by charging tool. Oxygen, compressed air or other flammable gas are prohibited to charged, in case of explosion.

Maintenance of Brake System

Inspection of the Performance of Parking Brake

! Caution: the performance of parking brake should be checked constantly to ensure the parking safety and the brake ability of emergency brake.

6. Adjust the air pressure of tyre to the prescribed value. Lift the working devices like moldboard.
7. Start engine, and drive the machine up to the slope of 15% (angle is 8.5°). The pavement should be even and dry.
8. Step down the pedal of service brake and stop the machine stable. Put the shifting control handle in neutral gear, and then shut down the engine.



9. Press down the parking brake button, and slowly loose the pedal of service brake. Check whether the machine is in the same position.

⚠ Warning: if the machine moves during inspection, it may cause body injuries.

Inspection of the Performance of Service Brake

⚠ Caution: in order to ensure the safety and accuracy, the inspection of the performance of brake system can only be conducted by professional people. Non-professional people are forbidden to conduct this inspection.

⚠ Caution: before inspecting the performance of service brake, you should guarantee the normal work of service brake system so as to use parking brake to conduct emergency brake.

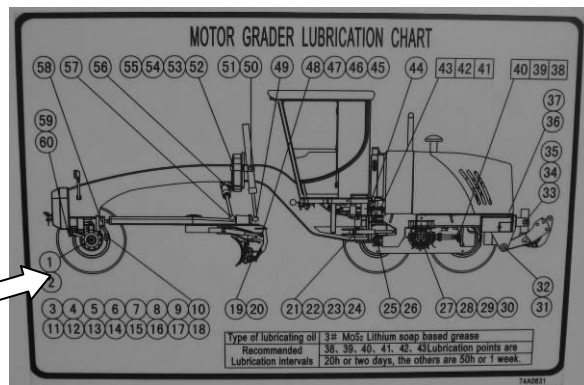
Drive the machine at the speed of 30 km/h on even and dry road. Step down the pedal of service brake completely. When the machine stops, first put the shifting control handle in neutral gear and press down switch of electromagnetic valve of parking brake, and then loose the pedal of service brake. Check the brake distance, which should be no more than 13m.

⚠ Warning: if the machine moves during inspection, it may cause body injuries.

Maintenance of Lubrication System

Schematic Diagram & Time Interval of Lubrication

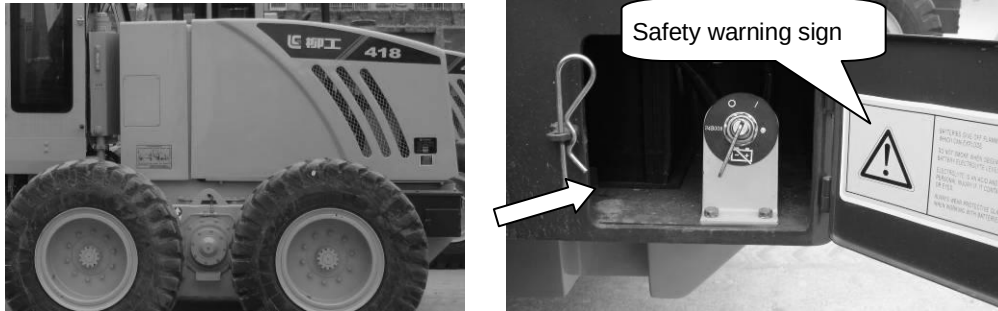
As this machine has no centralized lubricating device, lubricating grease should be filled according to the schematic diagram and time interval of lubrication, in order to ensure the normal work of every part in the machine. The lubrication system drawing is struck at the left side of engine hood, near the cab.



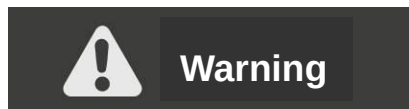
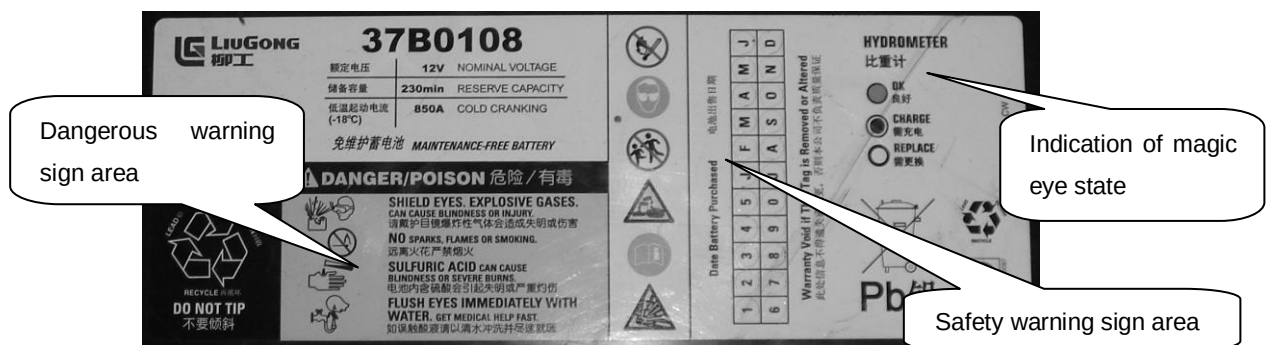
Oil	No. 3 lithium base grease
Time interval of filling lubricating grease	Time interval of lubricating the lubrication points 38, 39, 40, 41, 42, 43 is every 20h or 2 days.
	Time interval of lubricating other lubrication points is every 50h or 1 week.

Maintenance of Storage Battery

Storage battery locates at the left rear side of machine.



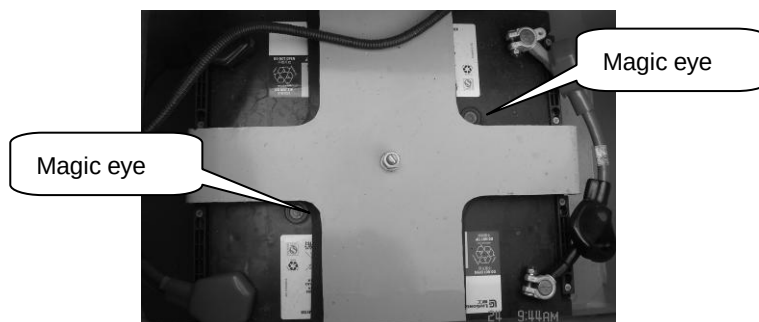
When operating the storage battery, you must obey the requirements of the safety warning signs struck near storage battery and on the top cover of storage battery.



Absolutely don't put the lit cigarette or naked flame near to the storage battery.

When touch the storage battery during work, you shall wear safety glasses and rubber gloves. It is required to pull on protective garment additionally.

Before conducting the work related with storage battery, shut down the engine.



Instruction of the charge state of storage battery:

Densimeter (also called gravimeter, hereinafter referred to as magic eye) of charge state is attached to on the top cover of storage battery, when the light is sufficient, you can visually check the charge state of storage battery by naked eyes.

Green magic eye—the charge state of storage battery exceeds 65%, and the storage battery is normal.

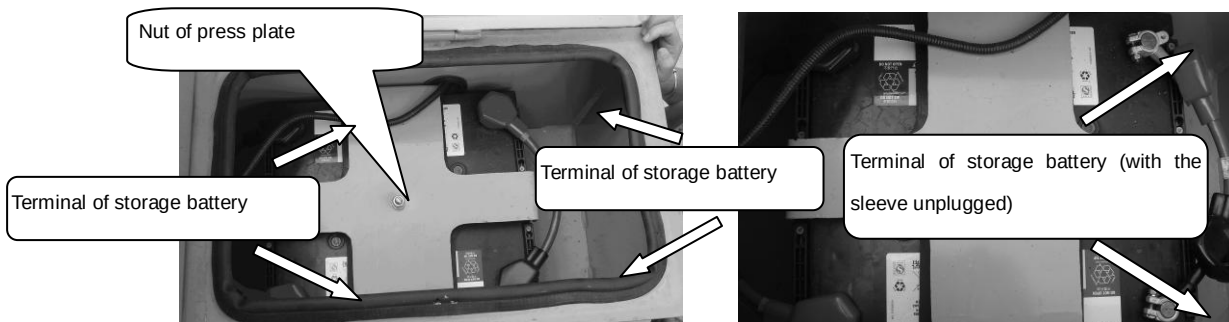
Black magic eye—the charge state of storage battery is under 65%, and it needs to be charged.

Transparent and bright magic eye—the storage battery is scrapped and needs to be exchanged.

When the housing of storage battery is broken or leaks acid liquid, or end post is broken, or when the magic eye is transparent and bright, you should find out the reason and then exchange the storage battery.

Cleaning of Storage Battery

Open the cover of storage battery case at the left of the machine, clean the ends and surface of storage battery with clean cloth, smear the terminal of storage battery with Vaseline, and then ensure the cable of storage battery is mounted firmly.



Caution:

1. After a period of time, the press plate of storage battery will be loosened by the vibration during the operation of machine. In order to avert looseness of storage battery, you shall constantly check whether the nut in the center of press plate is screwed tight. If it is loose, please screw it up.
2. After a period of time, the connection between the terminal of storage battery and the cable connectors will be loosened by the vibration during the operation of machine. In order to avert the possible looseness, you shall constantly check whether the connection between the terminal of storage battery and the cable connectors is loose or not.

Installation of Storage Battery

The storage battery with green densimeter can be mounted firmly and reliably in the stated parts of vehicle and put into use.

10. Make the cathode switch of storage battery in closed state. Turn the start switch (also called electric switch lock) to the "OFF" position and pull the key out.
11. Clean the ends and surface of storage battery with clean cloth. Absolutely don't use gasoline or any other organic solvent or cleanser.
12. When connecting the wire, first connect the anode of storage battery with that of engine, and then connect the cathode of storage battery with that of engine.
13. Screw the nuts firm and tight.
14. Put through the cathode switch of storage battery, insert the key and start the electric switch lock.



Warning: you must identify the positive (+) end and the negative (-) end

separately. Wrong installation will result in serious damage of pile head.

Charge of Storage Battery

15. Reason why storage battery is lack of electricity.

- Abnormal usage like turning on the electric appliances for too long with the machine not started.
- The situations like long time driving of machine, heavy current of electrical leakage of machine, or mounting additional electric appliances, cause the complete discharge of battery.
- Frequent starting of machine.
- Malfunctions of charging system of machine like useless engine or other electronic components, too low setting of the charging voltage of engine voltage regulator, or loose drive belt of engine, can make abnormal charge of battery, cause the battery lack of electricity and the magic eye of storage battery black, and even the fail of starting the machine.
- The stock time of storage battery is over 6 months.

The storage battery with electricity shortage caused by the above reasons can be back to normal by correctly and timely replenishing.

16. Check the appearance of battery before charging.

- The storage battery with broken housing of storage battery with or which leaks acid liquid can not be replenished. Find out the reason and then exchange it.
- Battery with broken end post can not be replenished. Find out the reason and then exchange it.
- The storage battery with whitish magic eye needs to be exchanged instead of replenished.
- Before replenishing, clean the end post and remove the superficial oxide skin.

17. Precautions of Charging

- Wear safety glasses.
- Keep a good ventilation of circumstance during charging. Charge it under normal temperature.
- Smoking is forbidden in case of the introduction of tinder.
- When connecting the wire after charging, first connect the wire of anode; when disconnecting the wire before charging, first disconnect the wire of cathode.

18. Operations of Charging the Storage Battery

- Ensure that the end post of storage battery is clean and that the connection of charging circuit is good.
- The anode of charger is connected with that of storage battery. The cathode of charger is connected with that of storage battery. Be sure not to charge the battery in series (24V).
- It is suggested to use constant voltage of 16.0V (the maximum voltage can not exceed 16.2V. The excess of this limit can cause many water electrolyzed, leading declined liquid level, whitish magic eye and broken battery). Charge the storage battery with current limiting 25A charger until the magic eye turns green, which means the battery is fully charged.
- If there is no condition to charge with constant voltage, you can use the following normative

constant current:

(1) Select 1/8~1/10A charging current with rated capacity (it is 12~15A for 37B0108 battery, and 10~12A for 37B0077 battery). The voltage at the final stage of charging should reach but not exceed 16V (the voltage at the final stage below 16V is easy to cause the magic eye black after the battery is filled.) If the charger can not guarantee that the charging voltage will be limited below 16V, the voltage of storage battery must be monitored every hour by people, otherwise it will affect the service life of storage battery or even make it inefficacy, because of water loss caused by over voltage.

(2) The corresponding relationship of charge time and voltage of storage battery before charging is listed as follows (For your information, the small the charging current, the longer the charging time).

Battery voltage	Charge time
12.55~12.45V	2h
12.45~12.35V	3h
12.35~12.20V	4h
12.20~12.05V	5h
12.05~11.95V	6h
11.95~11.80V	7h
11.80~11.65V	8h
11.65~11.50V	9h
11.50~11.30V	10h
11.30~11.00V	12h
Below 11.00V	14h

(3) Check the color of magic eye after charging. If the magic eye is green, it means the storage battery is fully charged. If the magic eye is black, check whether the charging wire is connected firmly and whether the connecting points are clean, or whether the voltage at the final stage reaches 16V. Check the voltage after 24h's laying, and then continue to charge it according to the relationship of charge time and voltage of storage battery.

(4) If the magic eye is whitish after charging, it may be caused by the air bubbles in the magic eye. You can slightly shake the battery to remove the air bubbles. If it is still whitish after shaking, it means the electrolyte is lost and the storage battery is scrapped which needs to be exchanged.

- As to the storage battery with the voltage lower than 11.0V, the electricity may not be charged into the storage battery at the early stage of charging. Because the sulphuric acid proportion of storage battery with serious electricity shortage is close to pure water, the internal resistance of storage battery is very big. At this time, you can decrease the charge current or change another charger with bigger power, or you can charge with another storage battery connected in parallel. With the charging of the storage battery, the sulphuric acid proportion in it will raise, and then the charge current can be gradually back to normal.
- During charging, if lot of acid spouts from the exhaust hole of storage battery, you should stop charging at once and find out the reason.
- During charging, if the temperature of storage battery exceeds 45 degree, you should stop charging, and wait until it drops to room temperature and then continue to charge it with the charge current halved.
- During charging, check the state of magic eye every hour. If the magic eye is green, it means

the storage battery is fully charged.

- It is suggested to smear Vaseline on the end post of storage battery after the charge and qualification testing, in case of electrolytic corrosion.



If the treatment of storage battery is incorrect during charging, the storage battery may explode.

When the housing of storage battery is broken or leaks acid liquid, or end post is broken, or when the magic eye is transparent and bright, you should find out the reason and then exchange the storage battery.

Keep ventilation during charging. Smoking is forbidden in case of spark and naked flame.

Maintenance of Storage Battery during Stock of Machine

- If the machine is going to be stocked over 15 days, the cathode wire of storage battery should be disconnected.
- Check the charge state of storage battery every other 3 month.
Storage battery with the voltage over 12.40V is the one with normal charge.
Storage battery with the voltage under 12.40V is the one lack of electricity.
- Must replenish the storage battery when it is lack of electricity. Replenishment should be done complying with the charging procedure.
- For the vehicle that does not disconnect the wire of storage battery, check the voltage state of the storage battery once every month. Storage battery with the voltage under 12.40V should be replenished complying with the charging procedure.
- For the storage battery on vehicle that is stocked over 1 year, if it is not replenished complying with the charging procedure, then it must be scrapped and replaced.

Reject of Storage Battery

Although the storage battery used for machine is watering-free and maintenance-free, whose inner structure can effectively prevent the acidic materials inside from polluting the environment, yet when it is scrapped, the polar plate containing lead, acidic materials and plastic encloser will cause pollution to the environment of varying degrees, for the broken of exterior structure or for other reasons. Therefore, the waste storage battery is not allowed to be littered. Please send the waste storage battery to be dealt with to professional processing station of battery or recycle bin here (if any) set up by the storage battery manufacturer.

Maintenance of Air Conditioning System

Inspection of Air Conditioner

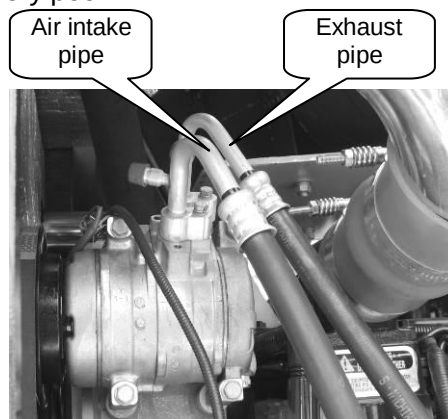
⚠ Warning: the refrigerant gas of air conditioner inbreathed through the lit cigarette or other smoking methods, or the smog given off by the flame touching the refrigerant of air conditioner, will cause casualty. Smoking is

forbidden during the maintenance of air conditioner or at the place possibly having refrigerant gas.

- 1 Start engine and run it at high idle speed.
- 2 Turn on the switch of air conditioner and adjust it in cooling mode, and then control the blowing speed in high speed mode by adjusting the wind speed switch.



- 3 Let the air conditioning system run stably for 2 minutes.
- 4 Open the rear hood, and touch the air intake pipe and the exhaust pipe to check the refrigerant in the system. If there is refrigerant in the system, the exhaust pipe is warmer than the air intake pipe. If there is not any refrigerant or there is a very few refrigerant in the system, the cooling effect will be very poor.



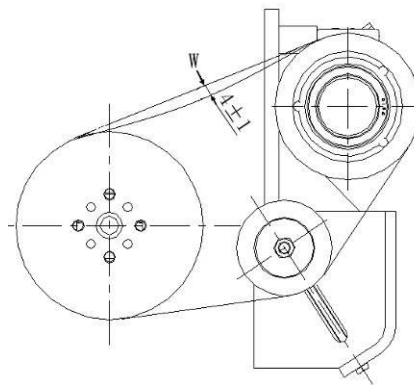
Checking the Cooling Medium in Storage Tank of Air Conditioner

When opening the air conditioner, check whether the cooling medium is sufficient or not by observing whether the cooling medium in the storage tank has air bubbles or not through the liquid glass on the storage tank. If there are lots of air bubbles, the cooling medium is insufficient; if there is a thimbleful of air bubbles or no air bubbles, the cooling medium is sufficient.



Checking the Tension of Compressor Belt of Air Conditioner

Rate of tension of compressor belt of air conditioner: if vertically adding a load $W=1.3\text{kg}$ to the point of belt at the middle of two points of contact made by the belt and two belt pulleys (the belt pulley of compressor of air conditioner and the belt pulley of engine), the flexivity produced by belt should be $4\pm 1\text{mm}$. See the following drawing.



If the belt has no tension, that is, the flexivity produced by belt is over $4\pm 1\text{mm}$, when vertically adding a load $W=1.3\text{kg}$ to the point of belt at the middle of two points of contact made by the belt and two belt pulleys (the belt pulley of compressor of air conditioner and the belt pulley of engine), the belt should be exchanged.

If the belt fluffs or has breaches, it needs to be exchanged.

Cab Air Filter—Cleaning/Replacement

Cab Air Filter

Cab air filter is composed by exterior air filter and interior air filter. The chocking-up degree of filter completely lies on the working circumstance of machine.

- ⚠ Caution:**
- 1. Cab air filter is only used to filter the dust from the air but not the poison gas!**
 - 2. If the exterior air filter is chocked up, it may cause the decrease of fresh wind in cab.**

The normal interval of cleaning air filter is 200h. The cleanness of air filter can be properly prolonged or shortened according to the quantity of dust in the working condition.

Exchange the exterior air filter every other 1,000 hour. Please choose the air filter complying with

ISO10263-2.

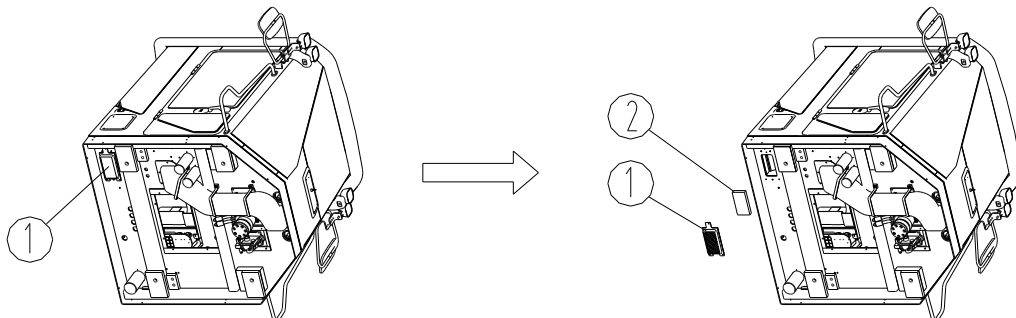
- ⚠ Caution:** 1. if you operate the machine under dusty condition, the cab air filter should be constantly cleaned.
2. If the body will be hit by compressed air or high pressure water, or if there will be danger to cause serious damages when compressed air or high pressure water is used to blow away the dust or dirt, you must wear goggles, dirt shroud or other safety appliances.

Cleaning of Exterior Air Filter:

- 1 Remove the fixed bolt of air filter housing at the right rear part of cab, and then take off air filter housing ① and exterior air filter ②
- 2 Clean the air filter with compressed air. If the air filter is oily or too dirty, use neutral medium to wash. After washing in water, completely dry it before using again.

Caution: if the chocking-up problem of air filter can not be solved by air blowing or water washing, or if the air filter is broken, you should change a new one.

- 3 Put the cleaned air filter ② into the groove of air filter housing ① and then mount it together with the air filter housing, and screw the bolt tight.

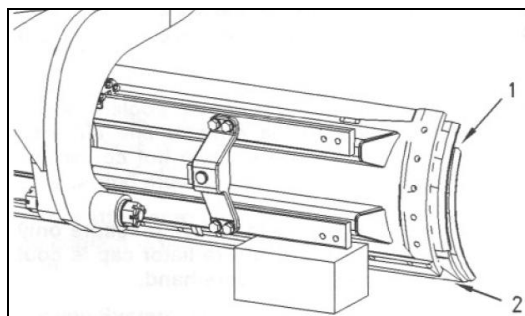


Other Maintenance

Main Cutting Edge and Side Cutter Board of Moldboard

—Check/Replacement

⚠ Warning: the falling of moldboard will cause injury for personnel, and underlay the moldboard well before replacing the main cutting edge or side cutter board.



The main cutting edge 2 and side cutter board 1 may be of damage or excessive abrasion. If

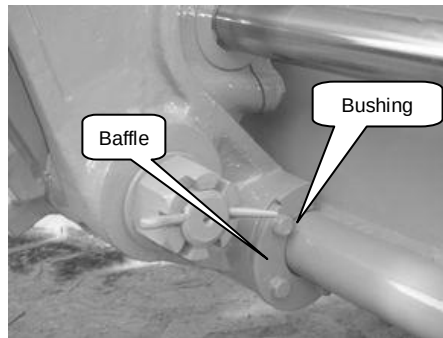
needed, replace the cutting edge 2 and side cutter 1.

- 4 Put the wedge block under moldboard, lower the moldboard on wedge block and do not underlay the moldboard too high. Underlay the moldboard with sufficient wedge blocks to remove the main cutting edge 2 and side cutter board 1 conveniently.
- 5 Remove the bolt, main cutting edge 2 and side cutter board 1.
- 6 Clean all interfaces.
- 7 Install new main cutting edge 2 and side cutter board 1.
- 8 Tighten the bolt to specified torque.
- 9 Lift the moldboard to take off the wedge block.

Guide and Bushing of Moldboard—Check/Replacement

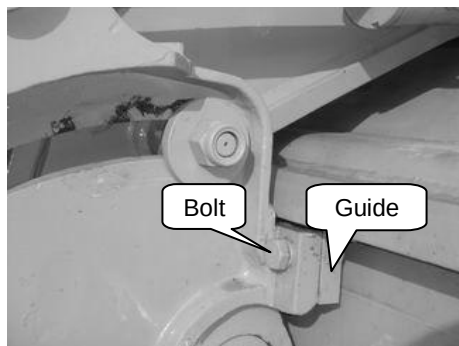
If the moldboard seriously shakes forward and backward when operating, replace the guide and bushing. When replacing the guide and bushing, replace them together. If the toughness of guide rail can be eliminated in time, the abrasion degree of bushing will be reduced and file will be used to finish the guide rail.

Replace the Bushing



- 10 Stop the machine in wide and flat place steadily, and conduct the parking brake to ensure the machine will not move when repairing. Place the wedge block under moldboard and lower the moldboard on wedge block.
- 11 Screw off the bolt on fastening baffle, and remove the baffle.
- 12 Remove the moldboard by sliding it and then remove the bushing.
- 13 Clean all interfaces.
- 14 Install new bushing and install the moldboard well.
- 15 Tighten the bolt on fastening baffle to specified torque.
- 16 Lift the moldboard to take off the wedge block.

Replace the Guide

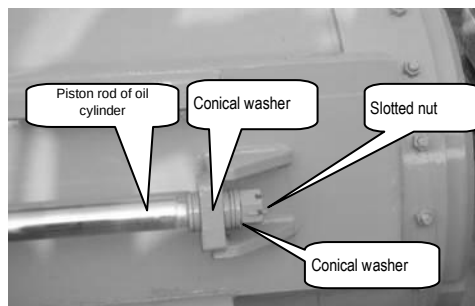


- 17 Stop the machine in wide and flat place steadily, and conduct the parking brake to ensure the machine will not move when repairing. Place the wedge block under moldboard and lower the moldboard on wedge block.
- 18 Screw off the bolt on fastening baffle, and remove the baffle.

- 19 Clean all interfaces.
- 20 Install new guide.
- 21 Tighten the bolt on fastening baffle to specified torque.
- 22 Lift the moldboard to take off the wedge block.

Piston Rod of Moldboard Sideshift Oil Cylinder—Fixing

The two conical washers can be rotated with hand after the slotted nut has been locked by the piston rod. Use the same method to fix piston rod when repairing or replacing the oil cylinder.



Gear Sleeve of Rear Scarifier—Check/Replacement

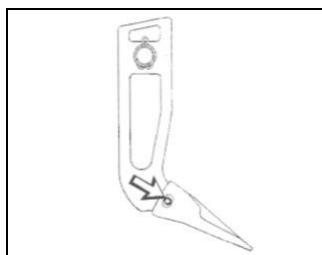
Check the gear sleeve of scarifier, if the gear sleeve is damaged or badly worn, please replace it in time.



The falling of scarifier will cause injury to personnel. Underlay the scarifier well before replacing gear sleeve.

When knocking the connecting pin between gear body and gear sleeve with strength, the connecting pin may depart outward and injure other people. Ensure that there is no person nearby when operating the pin. In order to prevent eyes from being injured, please wear safety-guard glasses when knocking the pin.

- 23 Underlay the rear scarifier well at a proper height when removing the gear sleeve.
- 24 Remove the pin from the side of snap ring of gear sleeve and then remove the gear sleeve and snap ring.



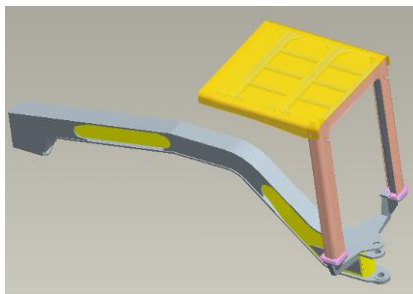
- 25 Clean the gear body, pin and snap ring and install snap ring to the slot at side of gear body.
- 26 Re-install the gear sleeve.
- 27 Drive the pin into snap ring, gear body and gear sleeve from the side of snap ring.
- 28 If the replacement of other gear sleeves is needed, please repeat step 2 to step 5.
- 29 Lift the rear scarifier, move off the pad and lower the scarifier to the ground.

Roll Over Protection Structure (ROPS)–Check (Optional)



Do not try to straighten the ROPS structure and do not repair ROPS structure by welding the stiffening plate to this structure.

If there is crack in welding line, casting and other metal parts of ROPS, please contact Liugong agent.



- 30 The external ROPS of this machine is connected with the two end faces of front frame by two bolt holes on the two pillar.
- 31 Check the ROPS to see if there are looseness or any other damaged bolts, and replace any damaged bolt.

⚠ Caution: better to use original parts and tighten according to specified torque. Coat the bolt thread of all ROPS with lubricating oil before the bolt is installed into ROPS. Otherwise, incorrect bolt torque will appear.

- 32 When operating the machine on rough surface, resultantly, if there is noise from ROPS, please check the mounting seat of ROPS.

Check Clearance of Engine Valve

⚠ Cautions: the adjustment of clearance of engine valve should be conducted by professionally trained personnel and special tools should also be used.

Please refer to *Manual of Engine Operation and Maintenance* for details of adjustment of clearance for engine valve.

Check the Air Intake System of Engine

Mainly check if there are cracked hose, loose clamp or puncture in this item, and tighten or replace parts according to needs to confirm there is no leakage of air intake system.

Check Driving Belt of Engine

Visually check the driving belt of engine to see if there is crack on crossed surface.

If there is vertical (length direction of belt) crack or small fallen-off material, the belt should be replaced. Please refer to ***Manual of Engine Operation and Maintenance*** for replacement steps.

Check Tension Pulley Bearing and Fan Shaft Shell of Engine

Check if the tension pulley bearing and the tension pulley can rotate freely.

Check shaft shell of fan and it can rotate without shaking or excessive end clearance.

Check the Shock Absorber of Engine

Please refer to ***Manual of Engine Operation and Maintenance*** for details.

Check and Replacement of Fuse

The fuse box is located at cab. The fuse is used for protecting electrical system and preventing damage when the circuit is over-loaded. If the fuse wire is broken, replace the fuse. If the new fuse wire is broken again, check the circuit, and repair the circuit if needed.

See the following table about color of strip-type fusible device (fuse) for each specification:

BX2011C-5A	Orange
BX2011C-7.5A	Brown
BX2011C-10A	Red
BX2011C-15A	Blue
BX2011C-20A	Yellow
BX2011C-30A	Green

Cautions: replace the fuse only with the same type and specification; otherwise, the circuit will be damaged. If the fuse needs to be replaced frequently, there may be circuit malfunction and please contact Liugong agent.

Test of Reversing Alarm

Turn the start switch of engine to “ON” gear to conduct the test.

Place the control handle of transmission at backward position, at the very moment, the reversing alarm should start to buzz.

The reversing alarm will stop buzzing until the control handle of transmission is placed at neutral or forward position.

Check of Seatbelt

Before using the belt, drivers should check abrasion and firmness degree of belt, and please replace it if necessary.

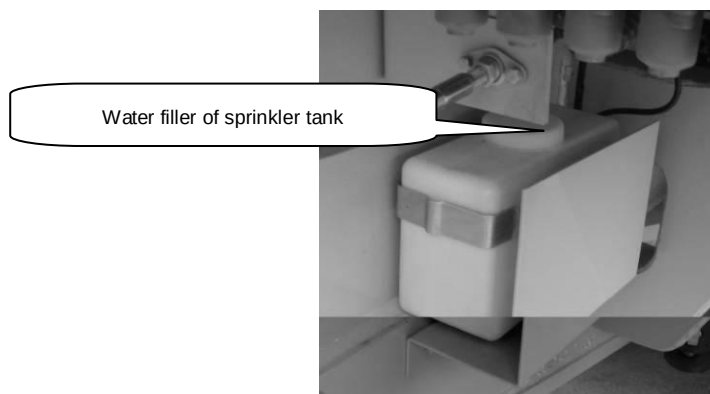
Adjust the length of belt before using to ensure that the belt is of safety control function and of certain comfort. The length of belt can be adjusted by moving the lock tongue position of belt.

Regardless of seatbelt appearance, replace the belt every three years. There is a date label on each belt and this label can be used to confirm the service life of seatbelt.

Please consult Liugong agent for replacement of seatbelt.

Cleaning Solution Addition of Window

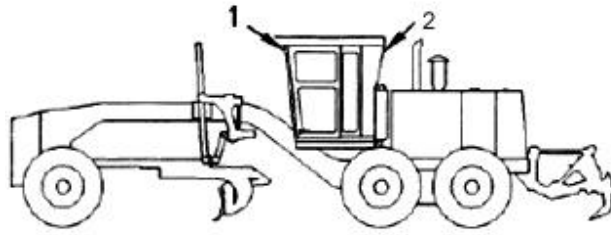
The sprinkler tank is located at the right of rear frame in lower part of cab; cleaning solution is added via water filler of sprinkler tank.



Frequently check if the water in sprinkler tank is run out to prevent the field of vision from being affected due to lack of water of sprinkler to clean the window.

When ambient temperature is lower than 0°C, drain off or add anti-freezing fluid to the sprinkler tank. Otherwise, the sprinkler will not work due to freezing, or even the sprinkler will be damaged by frost!!!

Check/Replacement of Window Wiper



Check front upper and lower part of wiper blade 1 of windscreen wiper, and please check wiper blade of rear window 2 wiper if the wiper is also installed to rear window of the machine. If there is stripe on windscreen left by wiper blade, please replace the wiper blade. Similarly, if there is stripe on rear window left by wiper blade of rear window, please replace the wiper blade.

Welding Repair

Comply with correct welding operation procedures to prevent the electrical parts and bearing from being damaged. When the welding is carried out on motor grader or engine with electrical parts, comply with the following operation procedures:

- 1 Stop the machine on level ground.
- 2 Close the electrical lock and shut off the engine.
- 3 Press down parking brake button to conduct the parking brake.
- 33 Switch off the negative switch of storage battery and cut off the connection between storage battery and frame.
- 34 In order to prevent crystal display instrument in cab and EST control unit of ZF transmission being damaged, be sure to pull out all connectors connecting instrument and harness of the motor grader and connector for control unit of ZF transmission before welding!
- 35 If there are other electrical parts on your machine, such as loudspeaker, in order to prevent possible losses, be sure to cut off all connectors connecting electrical parts and the harness of motor grader before welding.
- 36 In order to prevent harmful gas, clean the paint in place that needs to be welded.
- 37 Firmly clamp the ground cable of welder with parts that need to be welded, and it will be much better if the grounding position is neat to welding parts. Check and confirm that the circuit from ground cable to welding parts will not go through any of the following parts:

Bearing

Hydraulic oil cylinder

Controller

Inner circuit of other electrical components

Doing this is to reduce possible damage of following parts:

Bearing

Hydraulic parts

Electrical components

Other possible parts on the machine

- 38 Be sure to keep combustibles away from the welding site. Protect any cable well. Do not let any spark and welding slag splash the cable when welding, otherwise, it will cause fire disaster and unnecessary losses and injuries.
- 39 Weld with normal safety operation procedure for welding.



Using grounding point of electrical parts on machine as the grounding point of welder is forbidden!!!

If the welding will be conducted near the grounding point of electrical appliance, cut off the grounding point of this electrical appliance. And confirm that the welding loop of welder do not go through the electrical appliance before welding. Otherwise, these electrical parts will be damaged or even fire disaster will appear!

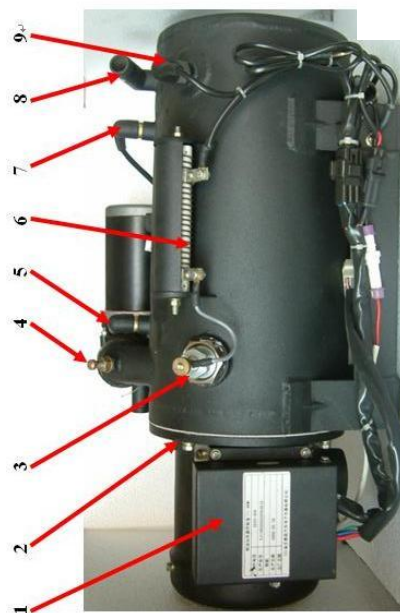
Voltage above 200V is forbidden to use continuously. The distance between welding area and grounding cable should be less than 1 m.

The seal ring and bearing should not be located at the place between welding area and grounding cable.

Be sure not to weld pipes with fuel, engine oil and hydraulic oil and not weld sealed or poorly ventilated vessel.

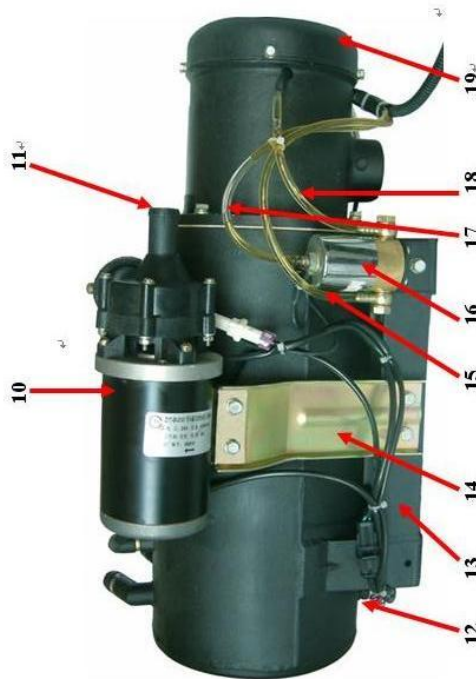
Fuel Heating System of Engine (Optional)

1. Overall Structure of Fuel Heater



Overall structure Fig.1

1. Electric control box
2. Rubber plug
3. Ignition plug
4. Release valve
5. Water-in temperature sensor
6. Relief resistance
7. Water-out temperature sensor
8. Water outlet
9. Flame temperature sensor
10. Pump and motor
11. Water inlet
12. Drain plug
13. Main bracket
14. Pump bracket
15. Oil-in hose of electromagnetic valve
16. Electromagnetic valve
17. Oil-return hose of electromagnetic valve
18. Oil-out hose of electromagnetic valve
19. End cover



Overall structure Fig.2

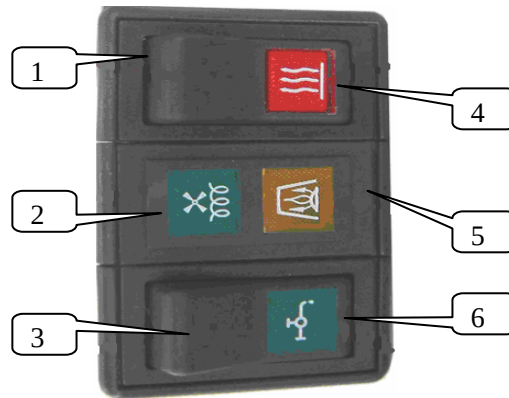
1. Electric control box
2. Rubber plug
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14. Pump bracket
15. Oil-in hose of electromagnetic valve
16. Electromagnetic valve
17. Oil-return hose of electromagnetic valve
18. Oil-out hose of electromagnetic valve
19. End cover

2. Operating Method

2.1 The following figure shows the positions of the buttons of engine fuel heating system



2.2 Button symbols and operating instruction of each button



1. Pump (power) switch 2. Power indicator light (green) 3. Heating switch 4. Burning indicator light (green) 5. Malfunction indicator light (yellow) 6. Preheating indicator light (red)

2.2.1 The outline of standard control panel is shown in the figure above.

2.2.2 First open all the water-in and water-out ball valves of the fuel heater when using the heater; close the water-in and water-out ball valves of the heater during a long term of non-use.

2.2.3 First turn on the water pump switch 1. The heater water pump starts working with power indicator light 2 (green light) on the control panel on.

2.2.4 Then turn on heating switch 3. The heater is now in the preheating condition with preheating indicator light 6 (red light) on.

2.2.5 About 2 minutes later the heater will be in the condition of normal burning with burning indicator light 4 (green light) on and preheating indicator light 6 (red light) off.

2.2.6 When the water-out temperature in the heater reaches $85\pm 5^{\circ}\text{C}$, the machine will automatically stop operating and heating, with burning indicator light 4 (green light) off and the pump working normally.

2.2.7 When the water-in temperature in the heater is lower than $65\pm 5^{\circ}\text{C}$, the machine will start automatically (with red light on) and be in the condition of preheating and ignition. After the burning is normal, burning indicator light 4 (green light) will be on. The heater will be in the circular working condition as analogized in turn.

2.2.8 To stop the machine, first turn off heating switch 3, and then turn off water pump switch 1. This machine is set with relay program to protect the basic machine, i.e. when the basic machine is shut down, the water pump and main motor will stop after 3 minutes' continuous operation. Therefore, don't cut the general power supply until burning indicator light 4 is off.

2.2.9 Modes of malfunctions:

When there is an ignition malfunction or the short or broken circuits of the water-in and water-out sensors, malfunction indicator light 5 (yellow light) will be normally on with preheating indicator light 6 and burning indicator light 4 off, and the fuel heater can not work normally. When there is a malfunction of one of the water-in and water-out sensors, malfunction indicator light 5 (yellow light) will blink with the frequency of 1 Hz and the fuel heater can work normally. When both of the water-in and water-out sensors fail, malfunction indicator light 5 (yellow light) will blink with the frequency of 0.5 Hz while preheating indicator light 6 and burning indicator light 4 will be off, and the fuel heater can not work normally. After doing troubleshooting, just restart the machine using the methods mentioned above (If heating medium is refilled, restart the machine after operating by the method of exhaust).

3. Repair and Maintenance:

In winter, the heater should be removed from the vehicle, and then it should be cleaned, inspected and filled with lubricating grease before being used. Usually the heater needn't to be overhauled during one heating season. When obvious thermal efficiency drop, ignition difficulty and other malfunctions are found, find out the reasons and do troubleshooting.

3.1 After the heater has been operated for a period of time (according to the service condition), unscrew the heater plug to clean up the accumulated charcoal. If the heating cord is burnt out, remove the heater plug and replace it with a new one.

3.2 In the case of a large amount of accumulated charcoal which would reduce the thermal efficiency, clean up the accumulated charcoal on the in-wall heat conduction strip of the water sleeve body and in the combustion chamber.

3.3 Keep the oil tank, oil tubes and oil filter clean and smooth. Periodically wash those devices according to the practical situation.

3.4 Use the coolant appropriate to the surrounding temperature as cooling medium for the circular system of the heater.

3.5 Periodically check the heater pump according to the service condition. Once there are malfunctions such as linkage of sealing surface or operating difficulty at the start, check and repair those malfunctions in time.

3.6 Maintain the electric control box, electromagnetic valve and other electrical elements of the heater by the methods used in the maintenance of general electric appliance with low voltage. All the performance parameters of the automatic controller are seriously adjusted by the manufacturer and mustn't be changed by the users without permit.

3.7 In normal case, the motor of the heater needn't to be repaired after 2,000h utilization. When abnormal operation which is caused by a long period of utilization or other reasons occurs, check and repair the motor. Check the states of carbon brush abrasion and axle lubrication. If necessary, fill the lubricating grease or replace the carbon brush.

Caution:

1. When filling coolant medium into the circular system, open the water pump switch of the heater and press the release valve on the water-in pipe of the heater body momentarily to release the air in the system. When pressing the release valve, if powerful liquid jets out from the exhaust hole, the air is entirely released. If necessary, start the engine and reinforce the system circulation to favor the exhaust.

The coolant medium filled into the circular system must be anti-freezing fluid which can achieve the requirements of surrounding temperature for vehicle utilization.

2. Don't use petrol for this machine.

Worm-Gear Box (Optional)

1 Check of Oil Level

- (1) Set level the worm-gear box.
- (2) Make sure that the oil level is in the mid position of the observation hole while observing from the oil level indicator.
- (3) Oil should be first added through oil fill hole (plug 2) if necessary.
- (4) Check the oil level after 50h continuous operation in general.

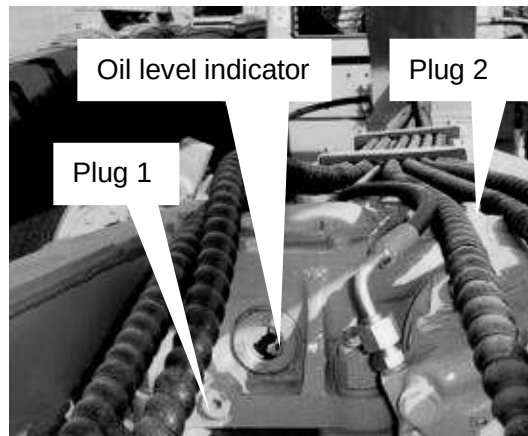


Fig.1 Worm-gear box

2 Replacement of Oil

- (1) Swing the moldboard to make it incline to one side of oil discharge plug (plug 1) to speed up the oil draining and set it against the ground.
- (2) Just remove oil discharge plug 1 to discharge the oil. To speed up the oil discharging, take off plug 2 at the same time. All the oil should be drained out.
- (3) Clean up plug 1 and replace its seal ring with the new, then mount and screw down plug 1 on the position of worm-gear box (plug 1).
- (4) Adjust the lifting oil cylinder with moldboard and set level the worm-gear box over again.
- (5) Fill with oil again from the filler hole (plug 2) to have the oil level in the mid position of the observation hole of oil level indicator. The oil volume is about 2.5L. Choose the oil grease with the type of 85W/90 GL-5 (in summer) or 80W/90 GL-5 (in winter).
- (6) Clean up plug 2, replace the seal ring with the new, and then mount and screw down the plug on the position of (plug 2).
- (7) Ensure at least one oil replacement annually.

Moldboard and Angular Device (Optional)

Moldboard and angular device are indispensable parts of working device. Different positions of the moldboard can be achieved by controlling the swinging oil cylinder to fit the demands of various working conditions. The moldboard can be side shifted and retracted from the left and right sides. It can be rotated in all angles and in 360°. However, when rotating or moving the moldboard, be careful not to damage the parts such as the frame, the ladder, the wheels and the steering pull rod, etc.

The adjustment of the rotation shovel angle can be achieved by controlling the tilting oil cylinder with the hydraulic angular device. Bigger rotation shovel angle that can produce higher shoveling pressure should be adopted to achieve the optimal efficiency of the motor grader. During the shoveling, a smaller shovel angle may reduce the cutting force while a bigger shovel angle may enhance the precision of smoothness and the mixing effect.

Repair and Maintenance

If the moldboard of the motor grader shakes (being loose) greatly, the guide and bushing should be replaced in pairs. Cleaning the roughness and unsmoothness on the guide rail in time can reduce the abrasion grade. The guide rail can be trimmed by a file.

- (1) Replacement of moldboard bearing bushing

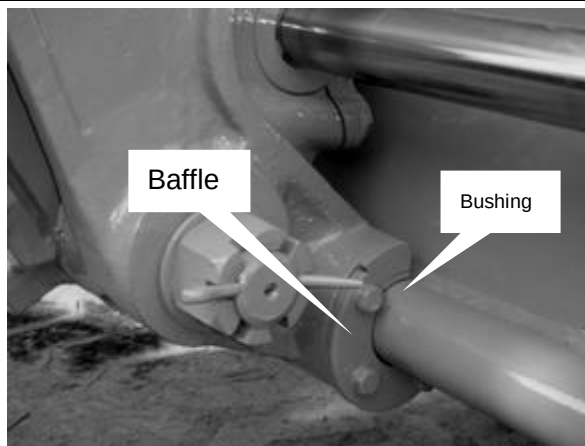


Fig.2 Moldboard bearing bushing

- a. Put the moldboard on two wood blocks
 - b. Remove the baffle
 - c. Remove the moldboard by sliding it, and then remove the bushing
 - d. Replace it with a new bushing and fasten the baffle
 - e. Replace both of the two bushings at the same time rather than replacing only one of them
- (2) Replacement of guide

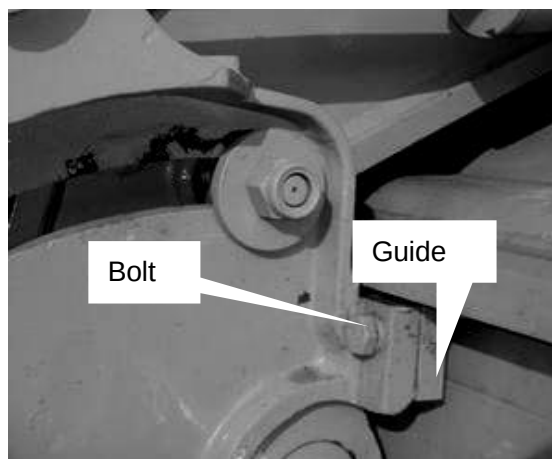


Fig.3 Guide of moldboard

- a. Put the moldboard on two wood blocks
- b. Unscrew the fastening bolts
- c. Remove the guide
- d. Replace it with a new one, and screw the fastening bolts
- e. Replace both of the two bushings at the same time rather than replacing only one of them

(3) Fix the piston rod of the moldboard sideshift oil cylinder

The two conical washers can be rotated with hand after the slotted nut has been locked by the piston rod. Use the same method to fix piston rod when repairing or replacing the oil cylinder.

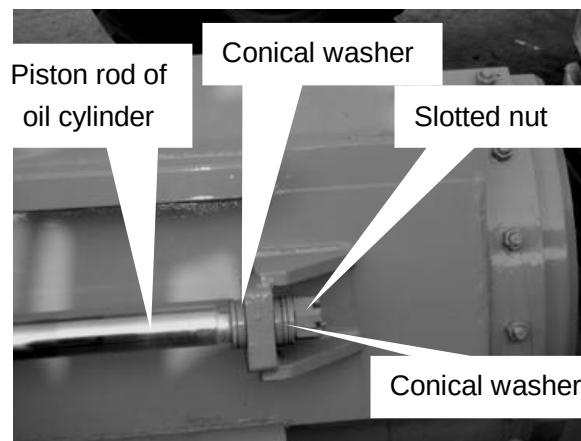


Fig.4 Piston rod adjustment of moldboard sideshift oil cylinder

Lubrication (Optional)

3# lithium lubricating grease is filled to the product when the latter one is delivered into the market.

2# lithium lubricating grease can be filled to the product which is working at low temperature.

- (1) The left and right bushings should be filled with lubricating grease once after every 50 hours' or week's operation. (Refer to the following figure)

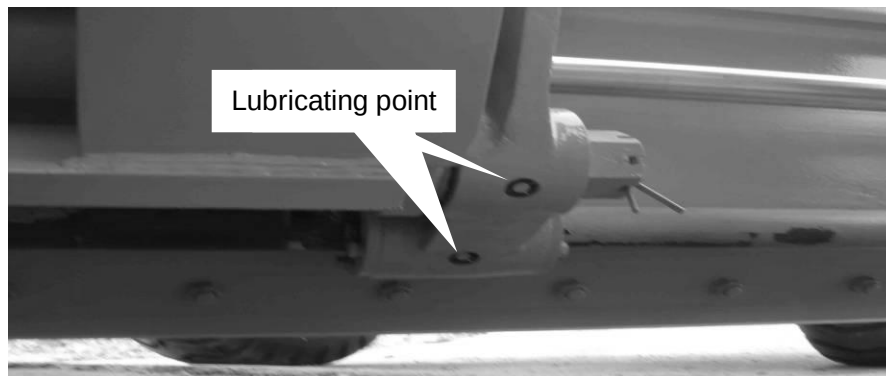


Fig.5 Lubricating point of moldboard bearing bushing

- (1) The circle, driving gear and each ball socket should be filled with lubricating grease once after every 100 hours' or 2 weeks' operation. (Refer to the following figure)

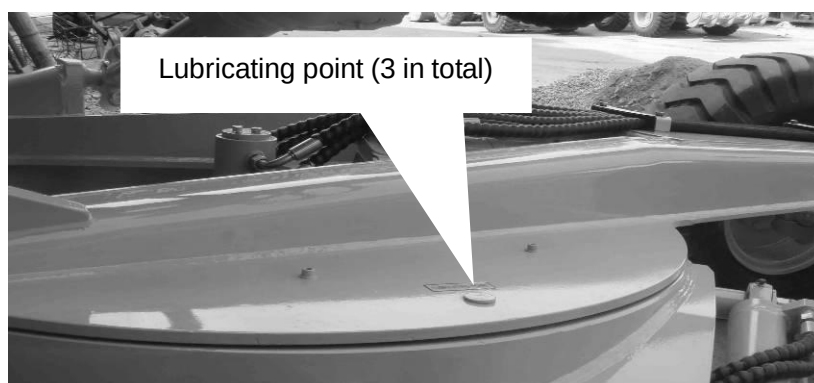


Fig.6 Lubricating point of circle

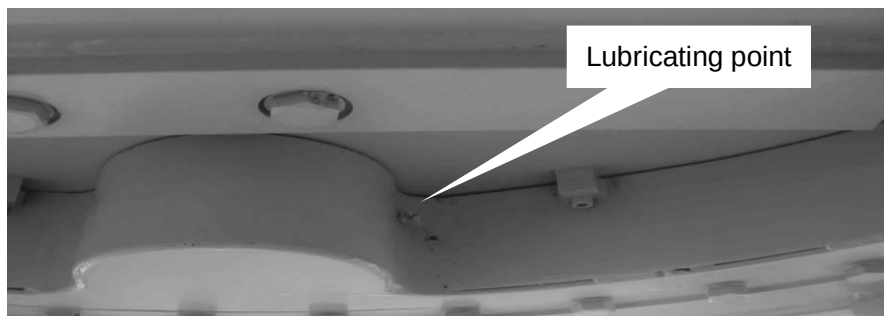


Fig.7 Lubricating point of driving gear



Fig.8 Lubricating point of ball socket