

Agrison Road Grader Operation Manual



PREFACE

Sincerely thank you for choosing "AGRISON" brand motor grader, we will provide high quality products and customer service for you.

Our company developed AGRISON motor graders by absorbing the essence of technology at home and abroad graders and combining with the excellent engineering design and mature experience. AGRISON motor grader is a kind of engineering machinery with versatility and high efficiency.

It is widely used in highway, airport, road construction, water conservancy construction and farmland transformation, also can realize the ground smoothing, slope scraping, bulldozing, snow clearing, placing materials, mixing and etc.

The operating instruction introduces the details of AGRISON motor grader, including technical features, performance parameters, working principles, structures, safe operations, maintenance and other aspects of the content.

In order to use the grader better, please read the instruction carefully before operating. It will :

- help you to understand the machine
- avoid the trouble due to improper operation
- increase reliability of the machine operating
- prolong service life of the machine
- reduce repairing cost and shutdown time.

Please ensure to read the instruction at any time and keep it available as the tool in the tool box. Only understand the content of it fully, you can operate the grader skillfully and safely.

Dear friend, thanks for your trusting in “AGRISON” products. Sincerely hope that everything is going well!

Have a nice day!

AGRISON AUSTRALIA

CAUTIONS

Users should be careful to maintain and correctly use the grader, AGRISON will not afford the responsibility causing by violate operation of the following rules.

Please read the instruction carefully before operate the grader.

Please operate the grader according to the instruction requirements and in correct range. Please do not use it in any other incorrect way.

The operator must be trained and skilled persons with stable emotion, clear mind and quick reaction. Please do not to allow the non professional technicians to repair or remove the grader.

Maintenance must follow the requirements of the instruction.

For the maintenance of the engine, please strictly follow the requirements of the engine manufacturer.

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CHAPTER I MAIN TECHNICAL PARAMETERS AND CHARACTERISTICS

Section 1 Main technical parameters

Overall dimension	Length	6800mm	Steering angle	Front wheels	± 45°
	Width	2050mm		Front leaning angle	± 16°
	Height	3200mm		Frame transfer steering angle	± 23°
	Front&Rear axle wheelbase	4950mm			
	Wheeltrack	1590mm			
	Ground clearance	Below front axle	450mm		
		Below rear axle	410mm		
Turning radius (m)	Normal state	Normal state		8	
		Front wheels inclination 17°		7.5	
	Full transfer steering 23°	Normal state		7	
		Front wheels inclination 17°		6.8	
Overall weight	5950KG				
Tyre specification	16/70-24				
Working performance parameter	Blade length	3040mm			
	Blade leaning angle	45°			
	Cycling angle	360°			
Driving parameters	Forward shift 1		Reverse shift 1		
	Forward shift 2		Reverse shift 2		
	Forward shift 3		Reverse shift 3		

	Forward shift 4		Reverse shift 4			
Diesel engine	Type	YCD4J12T-85				
	Rated power	62KW				
	Rated revolution	2400r/min				

1.1 PY980

1.2 PY9120

Overall dimension	Length	6800mm	Steering angle	Front wheels	±45°
	Width	2050mm		Front leaning angle	±16°
	Height	3200mm		Frame transfer steering angle	±23°
	Front&Rear axle wheelbase	4950mm			
	Wheeltrack	1590mm			
	Ground clearance	Below front axle	450mm		
		Below rear axle	410mm		
Turning radius (m)	Normal state	Normal state		8	
		Front wheels inclination 17°		7.5	
	Full transfer steering 23°	Normal state		7	
		Front wheels inclination 17°		6.8	
Overall weight	6110KG				
Tyre specification	16/70-24				
Working performance parameter	Blade length	3040mm			
	Blade leaning angle	45°			
	Cycling angle	360°			
Driving parameters	Forward shift 1		Reverse shift 1		
	Forward shift 2		Reverse shift 2		

	Forward shift 3		Reverse shift 3			
	Forward shift 4		Reverse shift 4			
Diesel engine	Type	YCD4J22T-115				
	Rated power	85KW				
	Rated revolution	2400r/min				

1.3 PY9130

Overall dimension	Length	7900mm	Steering angle	Front wheels	±45°
	Width	2050mm		Front leaning angle	±16°
	Height	3200mm		Frame transfer steering angle	±23°
	Front&Rear axle wheelbase	6120mm			
	Wheeltrack	1590mm			
	Ground clearance	Below front axle	450mm		
		Below rear axle	410mm		
Turning radius (m)	Normal state	Normal state		9	
		Front wheels inclination 17°		8.5	
	Full transfer steering 23°	Normal state		8	
		Front wheels inclination 17°		7.8	
Overall weight	7450KG				
Tyre specification	16/70-24				
Working	Blade length	3350mm			

performance parameter	Blade leaning angle	45°				
	Cycling angle	360°				
Driving parameters	Forward shift 1		Reverse shift 1			
	Forward shift 2		Reverse shift 2			
	Forward shift 3		Reverse shift 3			
	Forward shift 4		Reverse shift 4			
Diesel engine	Type	YN48GBZ				
	Rated power	92KW				
	Rated revolution	2400r/min				

Section 2 Main technical characteristics

By using the full hydraulic torque converter and the wheel side speed reducer make the torque enlarge and high efficiency. There are four forward shifts and four reverse shifts, can realize stepless variation at any shift. It can be operated in any work condition as the best speed.

It has wide vision, good sealing and comfortable cab with cooling & heating air conditioner. The hydraulic operating system adopts the load-sensing system including the variable displacement pump and load sensing multiway control valve, with the advantages of saving power, less heat, preselecting the maximum flow by multiway valve and good operating performances.

Service brake system adopts double-loop and hydraulic power controlling, has the advantages of smooth braking, safe and reliable, simple structure and easier maintenance. The double-loop can realize regular work by one loop when another one failure, which to ensure the reliability of non-power driving and braking state.

The blade tilt pin adopts hydraulic cylinder controlling, easier for shift operation.

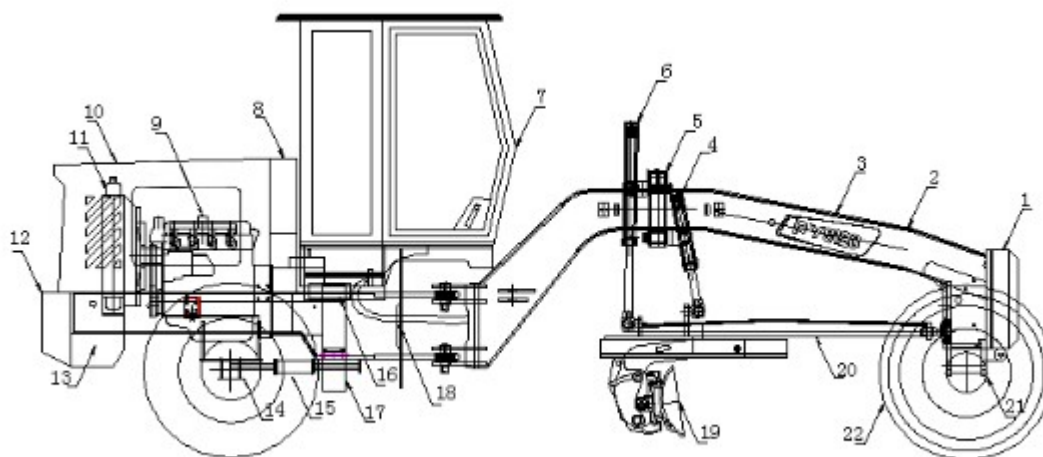
Many main components of the machine adopt international famous brand, such as diesel engine, gearbox, hydraulic torque converter, hydraulic pump, valves, motor and etc., which ensure the operating reliability and technology advancement.

Perfect safety protection devices make full guarantee of the operator's safety.

CHAPTER II STRUCTURE AND SYSTEM

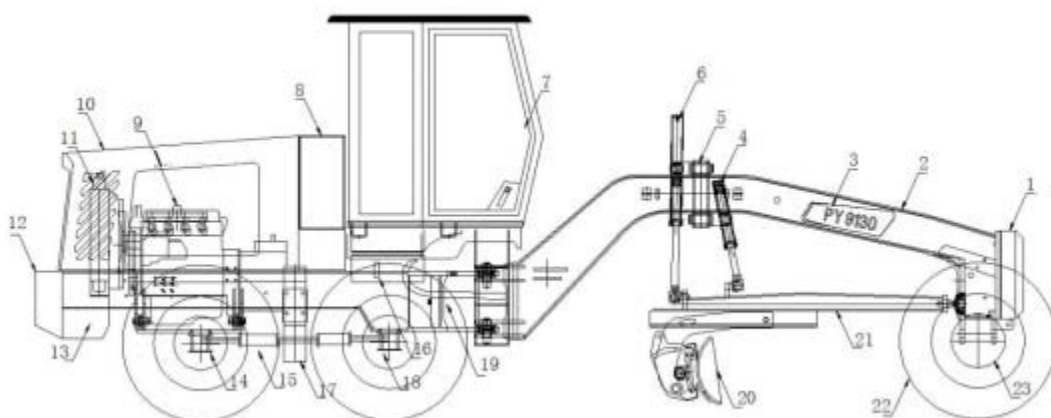
Section 1 Overall structure

I Overall structure (as Figure 1 PY980/PY9120 external structure)



1.front axle additional weight 2.frame 3.sign 4.swing cylinder 5.lifting system 6.lifting cylinder 7.cab
8.oil tank 9.engine 10.rear cover 11.water tank 12.rear additional weight 13.battery 14.rear axle
15.drive axle 16.circuit assembly 17.gearbox 18.hydraulic assembly 19.blade assembly 20.blade
carrier assembly 21.front axle 22.tire

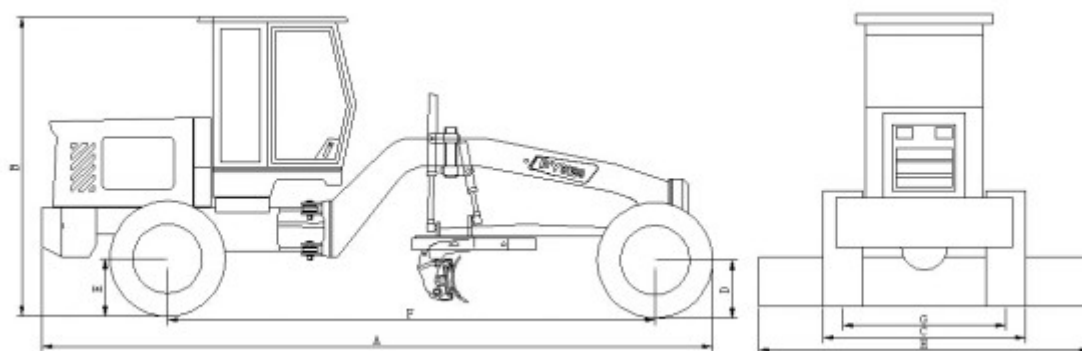
PY9130 external structure



1.front axle additional weight 2.frame 3.sign 4.swing cylinder 5.lifting system 6.lifting cylinder 7.cab
8.oil tank 9.engine 10.rear cover 11.water tank 12.rear additional weight 13.battery 14.rear axle
15.drive axle 16.circuit assembly 17.gearbox 18.front axle driving 19.oil circuit assembly 20.blade
assembly 21.blade carrier assembly 22.tire 23.front swing axle

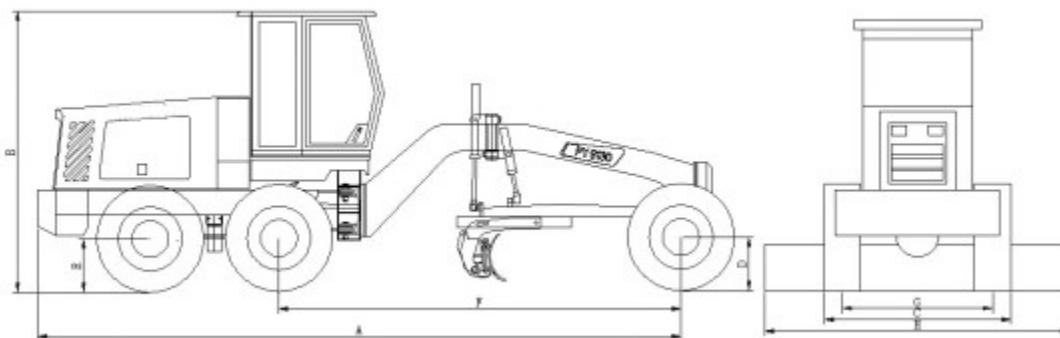
II Overall dimension

PY980/PY9120



PARAM.	A	B	C	D	E	F	G	H
SIZE	6800	3200	2050	450	410	4940	1590	3040

PY9130



PARAM.	A	B	C	D	E	F	G	H
SIZE	7800	3200	2050	450	410	4410	1590	3350

Section 2 Main components

1. Front and rear frame

Structure:

Front frame: section is structure of bending steel plate welding to box beam.

Rear frame: frame shaped structure formed by welding of thick steel plates on both sides.

2. Operating device

System: blade is hydraulic controlling.

3. Blade cycling device

Structural feature: hydraulic motor and turbo drive the blade cycle.

4. Tire

Standard tires on all four wheels: 14/70-24

Inflation pressure: front tires 0.2Mpa, rear tires 0.25Mpa

5. Cab

Steel welded frame support, glass of three sides and wider vision make the operating become more comfortable.

6. Seat

Spring vibration seat with adjustable performance.

Section 3 Power and drive system

Engine and gearbox are installed in rear frame. Operating devices are installed in front frame. The power from engine pass the hydraulic torque converter, gearbox and drive axle to rear axle. So grader can turn respectively or simultaneously using by the front wheels and articulated frame. When the front wheels turn (45° left or right), they can also make lateral tilt. If the above three steps operating together (front wheels tilt to the inside), the grader can get the minimum turning radius (6.8m). All the directional nouns including "front, rear, left, right" in the Instruction are based on the grader's driving forward direction.

1. Engine

The engine is adopted famous brand diesel engine of China. It has high operation reliability, flue saving, low noise and emission, completely meet the requirements of the national standard.

Rated power: KW

Rated speed: r/min

2. Hydraulic torque converter---gearbox

Type: 280 single stage three-element Connect with gearbox Power shift

Forward shift-----Neutral shift-----Rear shift

There is a working pump and gearbox control pump (gear pump) in the gearbox. The power transfer from the backward of the gearbox output axle to the rear axle after torque converter driving. Gearbox must be changed oil when it works 100 hours at the first time and then changed oil in every 1000 hours. The oil should be changed at least once a year, at the same time change the oil filter.

Here please pay more attention: do not reuse the oil filter even it is not damaged. When the engine shuts off and the grader needs to be dragged, the towing distance must be less than 10km and the towing speed should not over 10km/h as the gearbox request.

Notes:

When the grader start or drive normally, the parking brake must be released. Because of the large output torque from the torque converter, the grader can

overcome the brake torque of the parking brake even in the normal operation, which always make the driver have no sense. The result is the torque converter oil temperature rose sharply, brake overheating, smoking or burning. The parking brake can be used as an emergency brake. When the machine is at the welding operation, the shift selector cable must be cut off to avoid damaging the internal circuit by excessive current.

3. Front and rear axle

Front axle: swing box-type steering to the front axle, the swing angle is $\pm 15^\circ$, the front wheels lean $\pm 16^\circ$, steering angle is 45° .

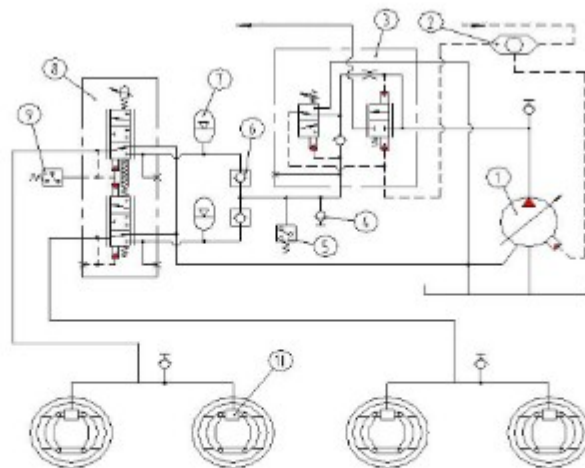
Rear axle: the axle of the grader.

Section 4 Hydraulic system

P120 grader is made of brake system, steering hydraulic system and operating hydraulic system.

1. Brake system

Brake system is used for speed down or stopping when the grader is running. The brake system of motor grader adopts with double loops and full power hydraulic brake system. It is smooth braking, simple structure, convenient maintenance, safe and reliable. The double loops controlling can still work normally when one of the two loops in trouble. Disc brake is high reliability. (As Figure 2)

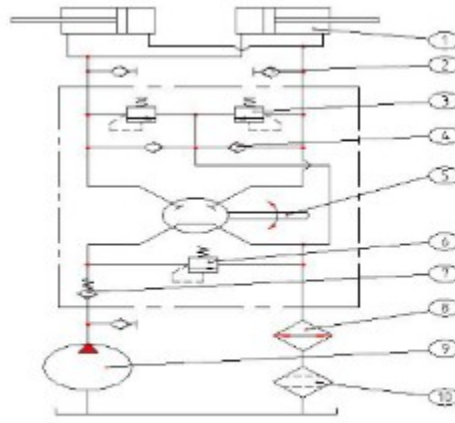


1. Variable pump 2. Shuttle valve 3. Fill valve

- 4. Pressure measuring adapter 5. Low voltage alarm switch
- 6. Check valve 7. Accumulator 8. Brake lights switch
- 9. Brake cylinder

2. Steering system

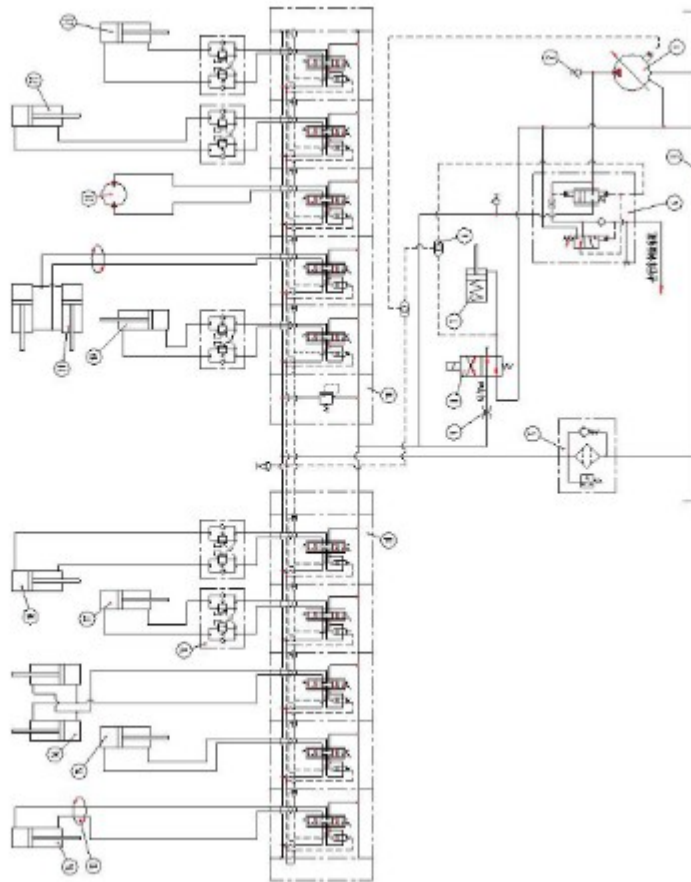
The steering system adopts the full hydraulic power steering with the advantages of compact structure, easy operating, good sensitivity and stability. It can reduce the pavement impacting without additional lubrication devices. The steering hydraulic system is shown in Figure 3. The gear pump is installed in engine port. Oil from the pump pass the priority valve into the steering gear. When steering wheel is turning, the steering gear put the hydraulic oil into the oil cylinder according to the turning direction of steering gear, which made the two front wheels turn as requirement. Steering gear is made by two parts which are steering direction valve and cycloidal motor. The cycloidal motor keeps the oil quantity in cylinder proportional to the steering wheel angle. When the pump unable to supply oil or reduce the oil quantity, the cycloidal motor automatically turn to the pump working condition to put the oil into cylinder. Manpower can only control the grader steering limit. The middle of the steering gear is opened, when the steering wheel is not working, the oil from the pump enters the oil tank directly and the gear pump is unload operating. Safety valve control the oil pressure in steering system to 15MPa, which can protect the steering system not overloading and make the excess oil flow into the fuel tank. When the oil cylinder striking by the outside, the impact valve will provide protection to oil cylinder and steering gear, which makes pressure of the two parts under 20MPa. The oil cylinder may produce instantaneous negative pressure because of the outside impacting, the suction valve will fill oil to prevent the cylinder cavitation. The check valve prevents the oil to back flow and steering wheel vibration at low speed. The impact valve, oil suction valve, safety valve, check valve and steering gear set as a whole, so that the structure of the steering system is more perfect. The radiator distributes the heat of the oil system and reduces the oil tank temperature, which control oil of the whole hydraulic system (including the oil of the brake system and operating hydraulic system).



1. Steering oil cylinder 2. Pressure measuring adapter
3. Impact valve 4. Oil suction valve 5. Steering gear
6. Safety valve 7. Check valve 8. Radiator 9. Pump 10. Oil filter

3. Operating hydraulic system

Hydraulic operating system consists of variable pump and load-sensing multi-way valve, with the advantages of power saving, less heat, preselecting maximum flow by multi-way valve and good operating performances. The principle of the hydraulic system is shown as Figure 4. The pump outputs the hydraulic oil to priority valve, which give the priority of the protection to vehicle braking system. Each valve plate in the multi-way valve has a pressure compensator. When the pressure values are different in each valve plate operating at the same time, it can uniform the pressure of flows. All the flows are distributed as operating requirement. When the valve center of the steering valves at the original position, the hydraulic pump just output the minimum pressure to control the flow. The hydraulic system is in unloading operating state. There is a relief valve in multi-way valve to prevent overload of the hydraulic system.



4. Hydraulic oil tank

Steering hydraulic system and hydraulic operating system share one hydraulic oil tank. The hydraulic oil is a high-cleanliness working medium and the oil tank should be kept clean. Don't open the tank casually. You should change the hydraulic oil when it discolor or opacity. The oil filled in the tank should be filter. The components of the oil tank provided as follows:

- 1). Air filter: filter the air and prevent the outside debris mixing in.
- 2). Level gauge: observing the oil capacity, temperature and perishable in the oil tank. The level gauge is in the middle of the up and down limit.
- 3). Oil filter: filter the pollutants of the oil. when the pollutants in the filter core is too much, the filtration pressure enlarge, the oil flow away from side valves, which ensure the normal work of the hydraulic system. The filter core should be replaced in this situation.

Section 5 Electrical and controlling system

1. Systems and functions

1). The starting & power system

It is including starting motor, generator, battery, ignition and other controlling components. In order to avoid damaging the starting motor by long time ignition, the starting protection relay (K2) is designed. When the engine is started, K2 will cut off the ignition circuit immediately, which avoid the trouble of opening and closing power supply, and make sure the key switch of the power supply back to "0" to turn off the system automatically.

2). Electronic monitor system

It adopts advanced microelectronic technology, which can make real-time monitor to oil pressure, brake pressure, cooling water, torque converter oil pressure and temperature in operating state.

3). Shift controlling system

It adopts domestic advanced level 280 shift transmission system of ZY company. When you change the shift to lower one at working state, E module will give instructions to electromagnet to downshift and interlocking if the engine speed is higher than the maximum allowable speed, to achieve the purpose of protecting the machine. When the brake is hit, the clutch disengaged automatically. The engine stops transmitting power to gearbox, which can save energy and protect the machine. In addition, it also provides neutral and reverse signal interface to support the whole electrical system.

4). Lighting system

It includes the headlights, back lights, working lights, the front turning lights, the back combination lights (brake, steering and reversing) and in-cab lights. The front lights is provided with a far and near lights controlling. The steering lights will light simultaneously in the parking time as warning lights.

5). Auxiliary electrical system

It includes the scrubber, horn, reversing buzzer and sound box. It provides a wild vision and comfortable working environment. The horn is mounted in the front of the cab, the reversing buzzer is mounted in the end of rear frame and the sound box is mounted on the top of the cab.

6). According to customers' demand to option air conditioning and heating.

2. Assembly features

1). The wiring harness of the machine is adopted bus bar type design making the wiring harness as center and each part connecting and communicating by the interfaces. The wiring harness of each part is independent, which makes installation and maintenance very easy. For example, the cab can be disassembled separately.

2). The distribution board and fuse box are installed in the place which has large maintenance space, shelter and vibration performance. Moreover, the fuse box installed position has been put up a fuse function sign which makes the maintenance very convenient.

CHAPTER III OPERATION

Section 1 New motor grader operating

1. New grader debugging

The motor grader should be checked before working, especially for the damage in transport. Meanwhile, we suggest you to do the following inspection and maintenance work:

Check the lighting and horn system, fill the tank full with oil and check the nuts fastening or not.

Check the tires pressure including the front and rear tires.

Check the oil level, engine, gearbox, rear axle, blade steering turbon gearbox and hydraulic oil tank.

Check the engine: If the brake pressure signal light is not bright after starting the engine, please check the brake and steering system.

Please fill in the butter according to the lubrication diagram after a week working.

Antifreeze: please use antifreeze diesel oil if necessary.

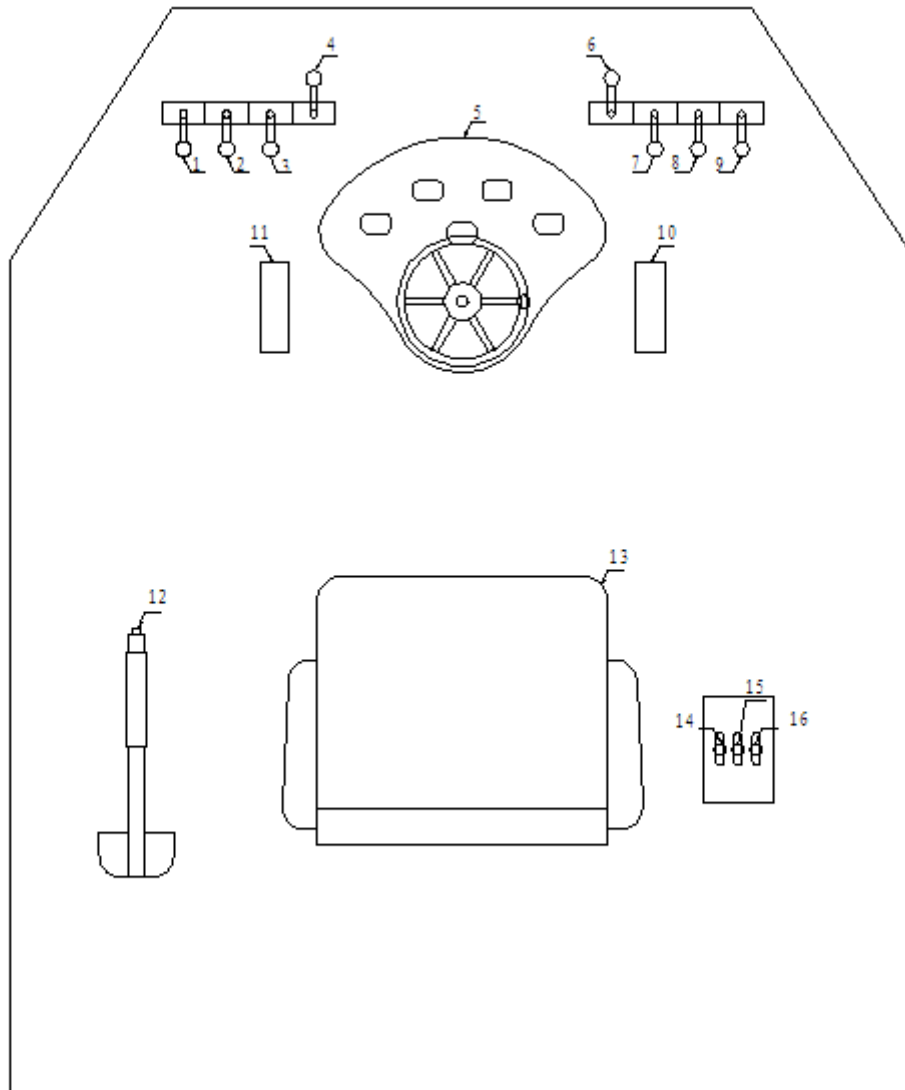
2. Running-in time

All moving parts from the gearbox to the hydraulic circuit need to be run in. During this period, the machine is not allowed to work in full load condition.

NOTE:

The grader can not work with full power in the first 50 hours operating time.

3. Control instrument and levers of the overall machine are shown as Figure 5.



1. Blade lifting lever(left)

2. Blade steering lever

3. Blade oscillation lever

4. Bulldozer lever

5. Dashboard

6. Articulated steering lever

7. Blade sidesway lever

8. Bucket

control lever

9. Blade lifting lever(right)

10. Accelerator pedal

11. Brake pedal

12. Hand brake

13. Seat 14. Forward&reverse gear 15. High&low speed 1

16. High&low speed 2

Section 2 Operating Instruction

1.Starting

1).Insert the key---“0”position without voltage.

2).Turn the key clockwise to “1”position---the total power is working.

Check all the parameters on monitor panel, if there is anyone displayed abnormally, please don't operate the machine to the next step. When all the parameters are displayed in normal, you can operate the machine continuously.

3).Turn the key clockwise to 2-3 neutral and ignite, after starting successfully move your hand away and the key switch back to “2” automatically, then the grader begins to work normally. The operator should always pay attention to all kinds of signal monitor in operating process, especially the fault light shining. If the buzzer alarming, please stop work immediately and check the reason. When all the fault are solved completely, the machine can be operated continuously.

2. Lights

The switch installed on the operating panel controls the headlights, steering lights, work lights, rear lights, parking warning lights, wipers and so on.

3. Steering wheel

The steering wheel controls the front wheels turning.

4. Horn button

The button is in the center of the steering wheel. You can press it when you need.

5. Accelerator pedal

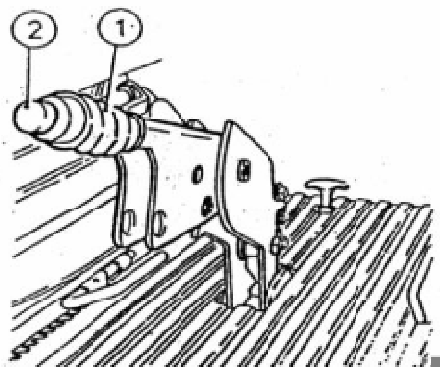
Accelerator pedal controls the engine speed.

6. Brake pedal

The brake pedal controls the two rear wheels by the hydraulic system. The brake pressure is determined by the pressure size on the brake pedal.

7. Hand brake

The hand brake (CD) controls the parking brake. When the operator should press the button (a>) to operate it.



8. Shift operation

Manual shift

9. Cab door

The door open outward 180° will be locked by latch. You must press the latch button in the cab if you want to close the door and when the door closed completely, the latch will lock again. The cab doors can be locked in the cab.

10. Seat

a. Weight adjustment

Turning the hand wheel (CD) can adjust the loading capacity of the seat range in 60--130kg.

b. Backrest

Rod (a>) can adjust the angle of it, for sure that the backrest is good fitting with the rod after adjustment.

c. The seat height and angle

They can be controlled by rod (@) .

d. Seat moving

It is controlled by rod (L). The seat can move forward and back, for sure that the backrest is good fitting with the rod after adjustment.

11. The front window wiper switch

It is a seesaw type button switch (as Figure 8), when press it the switch signal light will be bright. It will back to the original position automatically if your hand away. There is a functional card on the switch (as Figure 8), which is convenient for operating.

12. Sound box

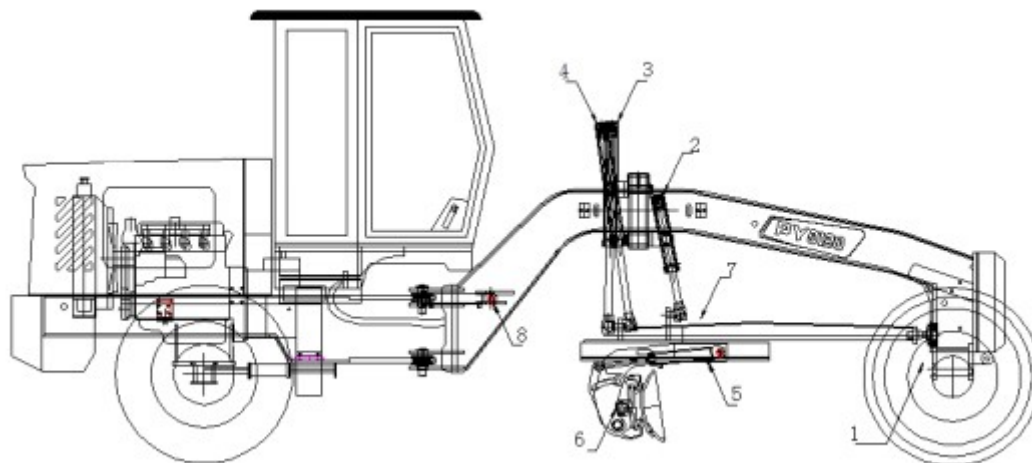
It is installed in the front top of the cab and shown on the functional panel.

13. Lights in cab

It is installed in the front top of the cab, there is a switch on the light holder.

Section 3 Operating devices

1. You can finish operating and adjustment all the operate devices in the cab by full hydraulic diving.



1.Wheel steering cylinder 2.Blade oscillating cylinder 3.Blade right lifting cylinder

4.Blade left lifting cylinder 5.Blade angle adjustment cylinder 6.Blade out cylinder

7.Steering hydraulic motor 8.Articulated cylinder

2. Blade adjustment

Operating the oscillating cylinder can make the blade in different working position according to the work requirements. The two sides of the blade can be extracted and retracted. It can finish steering any angle in 360° .

Note:when the blade is moving, must be careful not to damage the frame, ladder, wheels and ladder rod.

3. Preparation before driving

- a.Check the oil level and fill full
- b.Check the engine oil sump level when necessary, refueling it in need.
- c.Check the engine filter and air filter indicators, they shouldn't be displayed.
- d.Check the hydraulic cylinder oil level gauge after the blade and hydraulic cylinder landing and the hydraulic oil cooling.
- e.Check the following system while the engine working :
 - 1). Steering system: operating the steering wheel in clockwise and counterclockwise must be flexible and the forward wheel should steer simultaneously.
 - 2). Brake system:the working pressure indicator should not be displayed. After driving some distance, step the brake pedal to check the brake system.

4. Starting the engine

- A. Loosen the hand brake, make the gear lever back to the neutral position.
- B. Insert the ignition key and turn to "1" position to check all the indicators and dashboard working in normal state.
- C. Step the accelerator pedal (about 1/4 of engine speed)
- D. Turn the starting key to "3" position, loosen the key switch as soon as the engine starting.

Note: The start time should not more than 15 minutes. Keep the restart interval time in 1-2 minutes to protect the battery.

E. Once the engine is running, reduce the engine speed. The battery and oil pressure signal lights are shining in red.

Note: Don't operate the engine in high speed when the engine temperature is low.

5. Heating-up of the gearbox and hydraulic system

The engine should be operated in medium speed after the long-term parking, especially when the temperature is near or below zero. To avoid over load starting, at the beginning half an hour working the engine speed shouldn't

beyond 1/2 or 2/3 of the normal speed when the temperature below zero.

A. Heating-up of the gearbox

- 1). Match with hand brake
- 2). Start the engine in medium speed

B. Heating-up of the hydraulic system

At the same time of gearbox heating-up, you can move the hydraulic cylinder to heating up the hydraulic system

Note: Don't operate the control lever to the end position to heating up.

6. Drive the grader

A. Pull the gear lever to "forward shift 1 or 2" or "reverse shift 1 or 2"

B. Honking, loosening the hand brake, stepping the accelerate pedal and starting to drive the grader.

7. Dashboard display in driving

You must observe the following parts:

A. Signal lights of engine oil and pressure are in red.

B. Oil temperature of the torque converter indicator:

Operator should pay attention to oil temperature of torque converter indicator when the grader is driving. It should keep in 50-115° in green section. If it is over 115° and reach to red section, please reduce the throttle and change the shift to lower speed immediately. When the temperature is cooling down, you can recover the original running speed.

8. Continuous brake (torque converter)

Choose the appropriate gear when drive on the long downhill. The torque converter will produce brake function when the speed of the torque converter turbine is faster than that of pump speed connecting with engine. The 2nd gear speed fits for flat or moderate slope downward, you should shift to 1st gear for steep slope. The accelerator pedal will make the foot brake using with minimized limit.

9. Steering

A. Operate the steering wheel to realize the front wheels steering in hydraulic system.

B. Articulated steering is controlled by a lever (Figure 5).

Note : when driving on the flat road, the operator should make sure that the front and rear wheels must be keep in a straight line (visual).

10. Preparation before driving

Before driving, you should make preparation as follows:

- 1). Remove the dirt on the grader
- 2). Check the brakes, steering system, tire and lights.
- 3). Adjust the articulated steering, the front and rear must be in a straight line (Figure 9).
- 4). Check the front wheels, make sure the they are vertical.
- 5). Place the blade in driving state and rise it .
- 6). Rise the bulldozing plate completely.
- 7). Rise the blade and bulldozing plate height according to actual needs when driving and make sure that the two parts should not too low.
- 8).

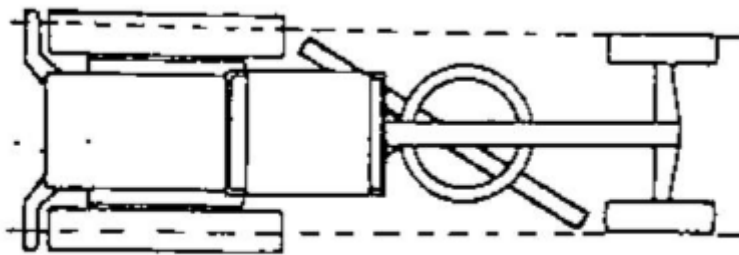


Figure 9

11. Parking

- A. Stop operating the accelerator (throttle)
- B. Place the gear lever at neutral state, step the foot brake pedal until the grader park completely.
- C. Take up the hand brake

12. Engine stall

Turn the switch key to "0" position to make the engine stall.

Note: Don't make the engine stall under full load. Make sure it runs 1 or 2 minutes at neutral state and then turn it off. If you need to park the machine temporarily at a dangerous place, please turn the key clockwise to "1" position and make the warning lights flashing in case of security incidents.

13. Parking the machine

- A. Take up the hand brake
- B. Place the operating devices to ground
- C. Remove the ignition key and lock the doors.

Note: Please reinforce the wheels If the grader is parked on the slope.

14. Notices of motor grader operation

The operator of the motor grader must be trained professionally so that he can operate the machine perfectly. Application fields of the motor are as follows:

- A. Cleaning up the ground, land leveling, rooting out the old road and flattening the hard road surface, scratching and shaping slope, mixing and paving, collecting and compacting materials, shoveling ice and snow etc.
- B. Articulated steering greatly reduces the turning radius, which makes the grader more flexible in working state. The machine can crab walking which makes the blade extend outside of the rear wheels. Articulated steering also provides the ability of self-help in difficult conditions.
- C. The important factor of the best efficiency is to choose the right blade steering angle and shovel angle. We recommend to adopt a large angle so that per cm work length can make higher dig up pressure. In the shoveling operation, the small shovel angle can reduce the cutting resistance. However, the large shovel angle can enhance the leveling precision and the mixing effect.
- D. The front wheels should be inclined to the side of the material outflow, when working on the slope, the front wheels should be in a vertical state, which has a better adhesion with the front wheels tilt.
- E. During the work condition, to operate the blade leading devices to make the shovel extend out without changing the blade working height.
- F. The motor grader is not suitable working in bad environment such as underground or unventilated condition, because the engine is a direct injection type, the special filter of the engine exhaust is not sufficient in bad working environment.

CHAPTER IV MAINTENANCE

In order to keep the grader in good technical condition, efficient and reliable and prolong service life, operator must read and performance carefully according to this maintenance norms.

Section 1 General technical maintenance

1. Brief introduction

General technical maintenance of the motor grader are daily maintenance, periodic maintenance and one-time maintenance (such as fault treatment). Technical maintenance is the same as the engine maintenance cycle. For the maintenance of the engine, please refer to the engine instructions. The maintenance time is calculated from the start of the engine working. After maintenance of 3000 hours, the motor grader should be come to the next new maintenance cycle, and so on.

2. Daily maintenance

1. Cleaning: remove the soil and sand from grader's surface; remove the oil dirt from the engine, hydraulic system and other components. Please mustn't make dirt into filler opening and air filter.

2. Check the connecting and fastening state of the machine, especially check the connection screw bolts between frame and the rear axle, connection screw bolts of driving wheels. If anyone is loosening or crack, please tighten or replace it promptly.

3. Check and eliminate the leakage oil in all parts of the machine.

4. Check the quantity of grease, fuel oil and hydraulic oil, add the new oil to the specified oil mark.

5. Add lithium base grease to the lubricating nipples.

A. At the first 200 hours working time, operator should check the grease quantity twice a day (10 hours).

B. You should fill the grease to transmission shaft with low pressure to avoid over filling by sudden pushing force. Add grease until the new oil output.

C. If the machine works in a dusty environment, please clean the water tank and all the oil cooling fins often. The times of cleaning should more than prescribed times.

D. Please refer to the following instructions to fill oil at the first time and maintain the filter.

Working time (h)	What you should do
After 50 hours	1. Replace the engine oil 2. Replace the engine filter 3. Fasten the screw bolts in the oil tank 4. Fasten the suction&discharge oil tube clamp of the oil cylinder head 5. Fasten the loosening parts of engine devices 6. Check and adjust the valve clearance if necessary

The first checking of 100 hours	1. Replace oil of torque converter and gearbox 2. Replace oil of the rear axle 3. Replace oil of balance box 4. Replace oil of the blade steering turbine box 5. Replace the oil filter of gearbox 6. Cleaning the oil suction filter of gear box 7. Replace the hydraulic suction oil filter
After 500 hours	Replace the oil in hydraulic oil tank

Section 2 Periodic technical maintenance

1. Technical maintenance after 50hs running

Before put into formally use, the motor grader should be tried running for 50 working hours according to the operating instructions. When finish the running time, you should take the technical maintenance as follows:

- 1). Repeat all items of the daily technical maintenance.
- 2). Check the tire pressure and wheel nuts (by 450Nm torque wrench).
- 3). Replace the engine oil. You should exhaust the old oil by running the machine and then add new oil. Check the oil level whether at the specified height after a short time running.
- 4). Check the hydraulic oil level and fill it to the specified level.
- 5). Check the engine coolant level and fill coolant to the specified level.
- 6). Check the rear axle and hydraulic system whether have leakage phenomenon, please eliminate it if anyone has and fill the hydraulic oil to the specified level.
- 7). Please clean the air filter once per 50 working hours.

2. Technical maintenance in 100 working hours

- 1). Repeat all items of the daily technical maintenance.
- 2). Replace the lubricant oil of rear axle and fill in the new oil when the old oil exhaust by running.

- 3). Clean the grease filter.
- 4). Clean the diesel oil filter.
- 5). Check the input and output air systems. Make sure the connected joints are tighten. Clean the input and output air system tubes if necessary.
- 6). Maintain the engine according to the engine maintenance instructions of 100hs.
- 7). Check the parking brake system and adjust it if necessary.
- 8). Check the steering system to see if the connections are loose, including the steering rod nut. Fasten them.
- 9). Check the blade guide clearance, adjust it if necessary.
- 10). Fasten the wheel nuts by 450Nm torque wrench.
- 11). Check the chain tension of the balance box, tighten it if it is loose.

3. Technical maintenance in 250 working hours

- 1). Repeat all items of the 100hs technical maintenance.
- 2). Maintain the engine according to the engine maintenance instructions of 250 working hours.
- 3). Clean the fuel tank oil pump filter and pipe.
- 4). Oil level of all the parts in rear axle and fill in oil maintenance.
- 5). Use the compressed air to blow the dust inside the generator and check all the parts. Eliminate all faults if there is.
- 6). Check the steering ring guide clearance and adjust it if necessary.

4. Technical maintenance in 500 working hours

- 1). Repeat all items of the 250hs technical maintenance.
- 2). Maintain the diesel machine according to the engine maintenance instructions of 250 working hours.
- 3). Check the wheel brake pad, replace it when the thickness less than 3mm.
- 4). Replace the gearbox filter.
- 5). Check the electrical circuit of switch and monitor devices. Please repair it immediately if there is damage.
- 6). Check the transmission shaft between gearbox to axle and engine to operation pump. Check the clearance of the universal joints transmission shaft to see if it is too large.

5. Technical maintenance in 1000 working hours and before the cold season

- 1). Repeat all items of the 500 working hours technical maintenance.
- 2). Maintain the all parts according to the maintenance instructions of 500 working hours.
- 3). Replace the hydraulic oil filter core.
- 4). Check the wear state of fans driving shafts and the belt tension drive shafts.
- 5). The engine must be given special maintenance the the temperature below 5° .

- A. Must fill in winter fuel and pay more attention to the moisture content of the fuel to prevent blockage of oil.
- B. You'd better fill antifreeze liquid to the cooling system or drain out the cooling water when the temperature reduce to 40-50° after parking.
- C. In winter or cold areas, the motor grader should not be placed in the open space. Otherwise the cooling water must be preheated before starting the machine.

6. Technical maintenance in 2000 working hours

- 1). Repeat all items of the 1000 working hours technical maintenance.
- 2). Replace the lubricate of the front axle and adjust the clearance of front wheels.
- 3). Check the clearance of rear axle main driving gears. It must be adjusted if it is more than 0.05.

7. Technical maintenance in 3000 working hours

- 1. Repeat all items of the 2000 working hours technical maintenance.
- 2. Clean the cooling system.
- 3. Clean the oil cooler.
- 4. Check the pump inside and fill in new grease.
- 5. Replace the air filter core.

Section 3 Maintenance of gearbox

Note: Check the oil level and change the it according to the lubrication chart. Replace the filter and clean the cooler. Take care when drain the oil to prevent burns.

1. Check the oil level

- 1). Check the oil level every day. During the checking time, the gearbox should be heated to 80-90° , the engine and gearbox are in neutral position.
- 2). Please fill in enough oil if necessary.

2. Replace the filter core

- 1). Remove the old filter away.
- 2). Install a new filter.

Note: the seal devices must be installed well.

3. Replace oil

- 1). Take off the oil plug and drain out the oil completely.
- 2). Clean the oil plug, coated with a thin layer of sealant and then tighten it.
- 3). Fill full of oil and take the shift gear to neutral position, then start the engine in slow speed. The oil level should keep in the middle position

between high and low scale on oil ruler when the engine is heated to 80-90° .

Section 4 Maintenance of rear axle

1. Replace oil

According to the lubrication chart to check and replace oil.

- 1). Take off the oil plug and drain oil. In order to drain out the oil completely, you should screw out the whorl and then tighten it after finishing draining.
- 2). Clean the oil plug, coated with a thin layer of sealant and then tighten it.
- 3). Fill new oil from the outlet to axle body, when the oil level reaches the middle position of the level indicator, screw the whorl again and tighten it.

2. Check the oil level

- 1). Oil level must be in the middle position of the level indicator.
- 2). Fill in oil if it is necessary.

Section 5 Maintenance of blade steering turbine gearbox

1. Replace oil

Note: According to the lubrication chart to check and replace oil.

- 1). In order to speed up the discharge of oil, the swing blade titles to the discharge oil plug (as Figure 10/1), and support the blade on the ground.
- 2). Take off the oil plug (as Figure 10/1) and drain out the oil completely. You can take off the plug (as Figure 10/2) at the same time. Clean the oil plug and change a new seal ring, then fix the oil plug again and tighten it.
- 3). Put the blade horizontally by the lifting cylinder.
- 4). Refill oil from input hole(as Figure 10/2), make the oil level reach to medium position of the check hole (as Figure 10/3).
- 5). Clean the plug(as Figure 10/2) and replace a new seal ring. Fix the plug again and tighten it. Capacity: 2.5L oil at the medium position of the check hole.

2. Check the oil level

- 1). Put the blade steering turbine gearbox horizontally.
- 2). The highest oil level must be in the medium position of the check hole (as Figure 10/3).
- 3). Fill in oil from the input hole (as Figure 10/2).

Section 6 Maintenance of operation and steering hydraulic systems

1. Check all the pumps, cylinders and valves in operation and steering hydraulic systems to see if anywhere has leaking phenomenon.

2. Working pressure of operation and hydraulic systems and overflow valves have been adjusted perfectly. All of the devices have been sealed. If you need to readjust the pressure because of faults, please contact to our service department. Don't adjust the pressure by yourself. Otherwise, we will not provide service if the seal damage caused by over pressure in the warranty period.

3. Replace the hydraulic oil

Note: Replace the oil when reach to the specified working hours. You must change oil in two cases which are repairing and pollution serious. Take a drop as sample to drop on the filter paper or blotting paper. If it leaves clear spots a few hours later, the oil must be replaced. Or the oil will do harm to the hydraulic system.

4. Check the oil level

- 1). When the engine flames out and operation devices down to the ground, the oil level must be in the middle of the level indicator.
- 2). Fill in hydraulic oil if it is necessary.

Note: Check leakage and seal situation when the oil is exhausting.

5. Replace or repair the operation pump and steering pump

- 1). Turn off the ball valve.
- 2). Replace and repair the operation pump and steering pump.
- 3). Reopen the ball valve after repairing finished.

6. Replaced the return oil filter core

- 1). Remove the filter cover
- 2). Take the whole filter core away.
- 3). Fix a new filter core according to the reverse steps.

Note: Must be careful not to damage the sealing ring of the support when reset the whole filter. Be sure of screw the filter cover tightly.

7. Check the function of steering system regularly. Check the pump, cylinder, pipeline and joint sealing condition of the hydraulic system, eliminate the leak phenomenon promptly.

8. Check the all the nuts and bolts of steering tie bar and steering cylinder, if anyone is loosen please tighten it.

Note: If the hydraulic steering system has failure, please stop working immediately and contact the professional workers in Hebei Xiaojiangniu Engineering Machinery Co.,Ltd. to repair it.

Section 7 Maintenance of fuel system

Note: Mustn't make open flame contact with the fuel, smoke and let the fuel overflow when the fuel system is working.

1. Fuel and fuel tank

1). Fuel (diesel GB252-77)

Operation in winter can choose No. -10 to -35.

Operation in summer can choose No. 0 to 10.

2. Fill oil into the fuel tank

1). Don't smoke or open flame when fill oil in and make sure to turn off the engine.

2). Fill full oil every time to avoid the condensation of water vapor.

3). Open the input hole cover

4). Screw the cover after finish the filling to prevent the oil pollution.

3. Clean the fuel tank

1). Clean the tank cover (tank top) and filter with kerosene carefully.

2). Loose the nut at the bottom of the tank to drain oil, then tighten it again after discharging. Make sure the sealing perfect.

Note: Cleaning the tank should be taken with the specific oil capacity (about 1/4 of the tank). Before cleaning the tank, the motor grader should stop for a period of time, so that the sediments can concentrate before cleaning.

Section 8 Maintenance of brake system

Note: Only professional person can carry out maintenance of this part.

1. Check the brake lining

Check the thickness of the brake lining according to the maintenance of 500 working hours. Change the new one when the thickness is less than 5mm.

2. Replace brake lining

Updating brake lining must be operated by professional persons. The new brake lining must be equipped and trimmed to ensure the necessary contact area. In addition, to avoid the imbalance of braking force, the lining of the opposite wheel always be replaced together.

3. Release of the hydraulic brake system

Hydraulic system must be release after changing oil, pipe joint loosening and repairing. In the engine operating process, the hydraulic oil tank should be filled full of oil and then release. This releasing work must be operated by two persons and all the wheel side brake parts must be released. Operation as follows:

1). Take off the rubber nut of the releasing bolt (as Figure 11/1).

- 2). Put a hose (as Figure 11/2) end on the releasing bolt and the other end into a clean container (as Figure 11/3).
 - 3). Loosen the releasing bolt half ring and step down the brake pedal at the same time. When the oil is flowing out from the releasing outlet, tighten the bolt and relax the pedal immediately.
- Note: oil from the release outlet instantly so the action and time must be coordinated perfectly.

Figure 11 shows the release of the brake system.

- 4). Others brake sub pumps also should be released according to the rules.

4. Hand brake

1). Hand brake adjusting

Note: pull the hand brake (as Figure 12/1) to the maximum position which is the maximum brake torque when adjust the hand brake.

- A. Loosen the nut (as Figure12/2) several rings
- B. Remove the pin (as Figure12/4)
- C. Separate the splice (as Figure12/3) from brake bar (as Figure12/6) and loose it several rings.

Figure 12 shows hand brake

- D. Put the splice (as Figure12/3) to brake bar (as Figure12/6), fix up the pin and tighten it.
- E. Fix up the lock nut.

Note: Replace the two brake linings at the same time.

Section 10 Lubrication and adjustment of front wheel bearing

Note: Only professional person can carry out maintenance of this part.

The grease quantity of each wheel is about 280g.

Grease type: No.2 extreme pressure lithium-base grease

1. Lift the front axle and remove the front wheels.
2. Check the hubs clearance.(as Figure 13/1)
3. Loose the hexagon bolt (as Figure 13/2) and inner hexagon bolt (as Figure 13/3).
4. Remove the cover (as Figure 13/4).
5. To see the number of the adjusting lining (as Figure 13/4).
6. Remove the hub by tools (as Figure 13/1).

Clean the hubs, steering knuckle shaft, bearing and cover, if any one is damaged, please replace it.

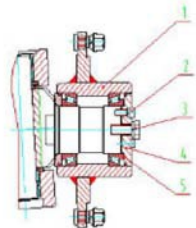
7. Fill in the new grease.

8. Installed the hub.

9. Check the bearing clearance, remove a adjusting lining if necessary.(as Figure 13/5).

10. Refit the cover by bolt (as Figure 13/4), tight the inner hexagon bolt (as Figure 13/3) for 78Nm and inner hexagon bolt (as Figure 13/2) for 250Nm according to ruled torque. The hexagon bolts should be tighten in order.

11. The hub (as Figure 13/1)should rotary easily without shock-jumping and turbulence clearance.



Section 11 Adjustment of blade

If the blade shakes seriously, please replace the guide plate and liner bushing. The two parts should be replaced at the same time. Eliminate the rough places of the guide plate by file in order to reduce wearing.

1. Replace the guide plate (as Figure 14)

1). Put the blade on two wooden pads.

2). Loosen the fasten bolt (as Figure 14/1).

3). Remove the old plate and install a new one, then tight the bolt.

2. The fixed blade leads piston rod of the cylinder

After the piston rod locking groove nut (as Figure 15/2), the two conical washers (as Figure 15/3) can be screwed by hand.

Note: Fix the piston rod in the same way when repair or replace the cylinder (as Figure 15/1).

Section 12 Maintenance of tires

All tires of a motor grader should be installed with the same type.

1. Maintenance of tires

A. Check the tires every day to see if there is any cut mark, crack and other sharp things, remove it immediately if there is.

B. Prevent the tires to erode with fuel, lubrication and grease.

C. The valve must be covered by cap to prevent the dirt entering.

D. The air leak valves should be replaced with new ones.

E. Check the tire pressure regularly. Too high or too low tire pressure will lead to wear.

Note: Keeping a suitable pressure determines effectiveness and life of tires. The ruled pressure as follows refers to cold-state tire (when the tire starts running). During running period, the tire flexure makes temperature and pressure increase, which has protective effect. Mustn't change it and reduce pressure by deflation.

F. Tire pressure

Tire type	Hierarchy	Pressure of front wheels	Pressure of front wheels
16/70-24	14	2.0	2.5

2. Fastening and replacing wheels

1). Fastening wheels

At the first 100 working hours, the wheel rim nuts must be checked every day and fasten it if necessary. Then fasten it per 50 working hours. Fasten torque is 450Nm. The wheel rim bolts, nuts and paint coating need a quite long time to achieve fastening work, so you must fasten it according to the rules. The wheel will fall down during running if it loosening or the bolt hole damaged. In order to tighten and check the wheel rim nuts, the torque wrench will be always used to ensure the specified tightening torque achieved.

2). Replacing wheels

Before lifting the motor grader, loosen the wheel rim nuts a circle. Before changing the wheel, ensure to tight the hand brake. When replace the back wheels, you can lift one side of the machine by hydraulic support. Therefore, the blade edge should be placed front of the supporting wheel, then lift up the grader by cylinder aside of the replacing wheel. You can lift up the front wheel by the blade. Before removing the front wheel, you must ensure the grader is supported firmly. Loosen the wheel rim nuts and remove the wheel.

Note: Make sure not to damage the thread of the wheel rim bolt when dismounting the wheel. Tighten the nuts crossly. Within 100 working hours of the new wheel, the wheel rim nuts should be retightened every day and specified tighten torque is 450Nm.

3). Pattern of the tire tread

You should pay more attention to the tire tread pattern when install the wheels. We suggest that the driving wheel tread pattern should be installed as Figure 17 shown, so that the grader can get maximum traction when forward driving.

(as the arrow direction)

The tire tread of the non-drive front wheel should be installed in reverse direction of the rear wheels.

Note: For some special working conditions, you can choose different patterns. But we recommend to listen to the opinions of the tire manufacturer.

Section 13 Maintenance of transmission shaft

You must replace the transmission shaft if there is obvious clearance between the universal-joint cross trunnion and splice tube. Don't remove the balance counterweight, damage of the balance devices will lead to instability of driving and early wear.

Section 14 Maintenance of electrical system

1. Repairing

Before repairing the electrical system, you must turn off the total power switch at first to stop working of the electrical devices.

2. Wires

Wires is an important part of the electrical system, please pay more attention to protect them and prevent damage. Check if the wires loosen, contact well and if the insulator is damaged or broken.

3. Three-phase AC motor

The AC motor maintenance and precaution see the engine maintenance instructions, check the tighten degree of drive belt on the driving devices regularly. In order to prevent damage to the three-phase AC motor and regulator, please comply with the following rules strictly:



- 1). When start the motor, must pay more attention to the connection with battery, keep anode and cathode installed correctly and the voltage in the range of 13.8~14.2V.
- 2). In fast charging, keep the connection fasten between the battery and the quick connecting.
- 3). If the motor grader needs welding, ensure the welding wire connected to the grader weld parts directly.

4. Storage battery

The storage battery of the grader is free-maintenance. If it is placed for a long time (more than six months), please check the quantity of electricity. Please check it regularly to prevent it loosen.

A. Check the quantity of electricity

Check the electricity by colors: light green means full of the electricity. Deep black means lack of the electricity. If test the acid concentration by acid test gauge, display of the electricity and concentration at 20°C as:

Full of charging 1.28KG/L

Half of charging 1.22KG/L

No charging 1.18KG/L

B. Assembly of battery

When remove the battery, you should cut off the negative line (-) at first and then the positive line (+). But when install the battery, the steps are reverse completely. The storage battery must be fasten in grader and connected with circuits of the electrical system correctly. Take a little lubrication coating the wire terminal.

Section 15 Precautions of placement

1. If a motor grader will not work for a long time, it should be cleaned and lubricate completely. The surface should be coated with grease and piston coated with thick Vaseline. If possible please wrap it with paper.
2. The grader should be placed in a garage or under a shelter, to prevent the tire damage to the sun and rain. Check the tire pressure regularly.
3. The grader had better be set up by the stow-wood and reduce the tire pressure 50% if it will be placed in the open or uneven ground. Cover the tires to prevent the sun and rain damaging.
4. In order to prevent corrosion, the fuel tank should be filled full of oil. If it is possible to add preservation (the total amount is 10% of oil).
5. It's reasonable to operate the grader regularly once every two weeks. Make the machine warm up and if possible driving it for a short distance. If the grader is placed on the stow-wood, make each shaft of the gear transmission system running to warm up the machine.

6. If the grader will be laid idle over four weeks, remove the battery and put it in dry and anti-freeze place, charge it once a month.

Section 16 Precautions of running again

If a grader is laid idle about one year, reusing should be replaced the hydraulic oil, gearbox, rear axle gearbox, balance box and blade steering turbine box. Replace oil of engine and all of above parts at the same time.(Refer to engine operation instruction)

1. Clean the piston bolt completely and fill full of lubrication in oil-cups.
2. Check all the following parts: hydraulic gearbox, rear axle balance box, blade steering turbine box, oil quantity of hydraulic oil tank, battery electrolyte capacity and tire pressure.

CHAPTER V COMMON FAULTS & SOLUTIONS

Section 1 Instruction

For the following maintenance items in the table, you'd better inform our customer service department. Because our maintenance workers have finished the special training and have special tools, which ensure that the maintenance work can be finished smoothly and correctly. All welding parts of the grader can only maintained by our customer service department and our factory to ensure strength of the structure. Don't weld anything or connect ground wires of the welding devices on the axle body.

Section 2 Analysis and solutions of common faults

Faults	Reason	Solution
I. Engine 1. Engine can not start	1. Fault of oil supply system a. Fuel system has air b. Blockage in fuel system c. Oil pump doesn't supply or intermittent supply d. Fuel injector works badly e. Fuel supply angle is incorrect	a. Release the Air by oil pump and check the leakage place. Remove and clean. b. Check and repair c. Check the spray state of spray nozzle d. Check oil injection pump plunger, the oil valve wear and spring is broken or not e. Check and adjust
	2. Inadequate compression pressure a. Piston ring wear b. Piston ring wear c. Valve leakage d. Temperature is low at the	2. a. Replace the piston ring b. Clean the adhere things c. Make corresponding treatment in

	compression end	valve spring broken or loss elasticity, improper valve clearance and bad sealing d. Outside temperature is low. Solute it by preheating or other methods
	3. Faults of electrical equipment a. Battery power shortage b. Poor connection of electrical wires c. Poor connection between starter brush and commutator d. Starter clutch torque shortage and gear cannot be embedded in.	a. Recharging to meet the requirements b. Check the wires whether correct and tighten c. Repair or replace brush and clean the commutator surface by sandpaper. Blowing the dust. d. Increase the pads and adjust e. Look for the reason and solute it.
2. Instability of the rotating-speed	1. Oil supply system has air. 2. Too much water in the fuel 3. Fuel pipelines leak oil 4. Governor work is not normal 5. Blowby in cylinder 6. Oil supply situation of cylinders are different a. Oil supply of cylinders are different b. Oil quality of injector is not good or can not inject c. Oil pump is broken.	1. Release air 2. Check the water content of the fuel 3. Check and eliminate 4. Check and adjust the speed governor 5. Check the cylinder cover bolt, replace it if necessary 6. Check the plane height and height difference of the cylinder liners a. Check and adjust b. Check the oil injector, clean and replace parts and springs
3. Engine power shortage or drop suddenly	1. Air filter block up 2. Valve spring or bolt is damaged 3. Valve clearance is improper 4. Compression pressure is inadequate 5. Oil supply advanced angle is incorrect 6. Fuel supply system has air or blockage 7. Oil supply is inadequate 8. Poor atomization of fuel injector 9. Governor failure 10. Engine over heating 11. Internal carbon of engine is too much 12. Release air pipe blockage	1. Clean or replace the filter core 2. Replacement 3. Adjustment 4. Treatment according to section 1 and 2 of this chapter 5. Checking and adjustment 6. Treatment according to section 1 a, b 7. Check the fuel injection pump plunger and oil outlet valve seat 8. Check, clean and adjust the pressure 9. Check the governor and make corresponding adjustment 10. Maintain cooling system and clean scale deposit 11. Remove carbon deposit 12. Remove blockage
4. Abnormal sound when engine running	1. Oil injection time is early cause the cylinder inside emitting crisp metal banning sound 2. Oil injection is time is late cause the cylinder inside emitting low and unclear sound 3. Clearance between the piston and cylinder is too large, cylinder has striking sound when start the diesel motor, the sound will reduce with the motor heating 4. Clearance between piston pin and pin hole is too large, cylinder will emit light but sharp sound, especially when idling 5. Clearance between the main bearing and connecting rod	1. Adjust the fuel supply advanced angle 2. Adjust the fuel supply advanced angle 3. Replace the piston and cylinder liner 4. Replace the parts to ensure the specified clearance 5. Replace the parts to ensure the specified clearance 6. Replace the parts and adjust the valve clearance 7. Replace the parts and adjust the valve clearance 8. Check whether the piston and valve collide and then check whether the piston and gear mark right 9. Replace the parts according to the

	bearing is too large, there is a heavy and powerful striking sound when speed of the engine reduce suddenly 6.Crankshaft clearance is too large, there is a striking sound of moving crankshaft when idling 7.There is a ruckus or light and rhythm striking sound at the cylinder cover when valve spring broken, push rod bend or clearance of the valve too large 8.Piston push the cylinder cover. When the engine is running at low speed, there is metal striking sounds near the cylinder cover 9.The gear running speed reduce suddenly because of the large wear clearance,there is striking sounds near the gear.	situation
5.Oil temperature is too high	1.Engine load is too heavy 2.Oil shortage or too much 3.Serious leakage 4.Inner of oil cooler is block up, pressure of bypass valve is not right	1. Reduce the load 2. Increase or decrease the oil according to the rules 3. Replace the piston ring or cylinder liner 4. Check, clean and adjust the bypass valve
6. Abnormal releasing smoke color (gray in normal)	1. Blue smoke a. Inject oil, piston ring is fixed against and stuck, wear seriously b.Oil sealer of valve rod is damaged 2. White smoke a.Oil injector atomize badly and leak b.Cylinder has water 3.Black smoke a.Engine overload b.Oil injection is too much c.Oil supply is too late and after-burning is too much d.Incorrect clearance of valve, valve viscosity or badly match between the valve and support lead to leak air e.Air filter core blockage	1. a.Check and remove faults b.Replace the oil sealer 2. a.Adjust the pressure of oil injection and check the part seal state b.Check and remove faults 3. a.Adjust to specified load range b.Adjust oil supply quantity c.Adjust oil supply advanced angle d.Check the valve clearance, valve spring, support matching state e.Check and remove the faults
7.Oil pressure is inadequate	1.The pressure gauge is damaged or connecting pipe is blocked 2.Oil is not adequate 3.Oil is too thin 4.Oil pump gear is wore or assembled poorly 5.Oil strainer mesh or filter is blocked up 6.Springs of pressure limiting valve or stable valve is damaged 7.Oil pipeline blockage and leakage	1.Replace the pressure gauge or clean the pipeline 2. Fill oil to specified level 3. Check oil type, whether oil is diluted by fuel or oil temperature is too high and then adjust them 4.Adjust clearance or replace gear 5.Clean or replace the parts 6.Replace parts 7.Check and treatment 8.Check and treatment

	8.Clearance is too large of all parts	
8. Temperature of cooling water is too high	1.Temperature meter or response plug is failure 2.Water shortage 3.Engine water pipeline is blocked. Radiator fin brass pipe dirt 4.Overload of engine	1. Check and replace 2. Add cooling water, release air, adjust the belt tension and check the water pump clearance 3. Check, clean and reduce the loader 4. Reduce the loader
9. Oil quantity of oil pump is inadequate	1.Oil pump check valve spring is broken or wearing 2.Plunger is wore 3.Oil screw leakage or pipeline blockage	1. Replace spring and repair check valve 2. Replace the plunger 3. Replace a new screw and tight it. Clean the blockage
10. Faults of oil pump	1.No oil supply - a.Fault of oil pump - b.Filter and pipeline block up - c.Air in oil supply system - d.Spring of oil output valve break 2.Output oil uneven - a.Air in oil supply system - b.Spring of oil output valve break - c.Sealing surface and outside of the output oil pump wear - d.Piston wear or spring break - e.Impurity blocks the piston - f.Input oil pressure is too low 3.Shortage of oil supply - a.Output oil valve leakage - b.Joint leakage - c.Piston wear	1. - a.Check and remove - b.Clean or replace parts - c.Release the air - d.Replace spring 2. - a.Release the air - b.Replace spring - c.Replace parts and or repair - d.Replace parts - e.Cleaning - f.Check the input oil pump or filter 3. - a.Repair or replace parts - b.Check and repair - c.Replace parts
11. Oil injector faults	1.Less or no oil injection - a.Air in oil pipeline - b.Needle valve locks with the vale body - c.Needle valve looses to the valve body - d.Oil leakage serious of oil supply system - e.Oil pump works abnormally 2.Low pressure of oil injection - a.Adjust the screw - b.Spring deformation 3.High pressure of oil injection - a.Needle valve locking - b.Oil hole is blocked up - c.High pressure of pressure adjusting spring 4.Leakage serious - a.Pressure adjusting spring is broken - b.Needle valve and valve seat are broken - c.Needle valve locking - d.Compression cap deformation - e.Injector connect surface is uneven 5.Bad atomization - a.Needle valve deformation or wear - b.Needle valve and valve seat	1. - a.Release the air - b.Repair or replace it - c.Replace it - d.Tighten the joints or replace it - e.Adjust the oil injection pump again on the test bench 2. - a.Adjust to the specified pressure - b.Replace the spring 3. - a.Repair it - b.Clean it - c.Adjust again 4. - a.Replace the spring - b.Repair or replace it - c.Clean or replace it - d.Replace it - e.Grind or replace it 5. - a.Replace it - b.Replace it - c.Clean it - d.Repair or replace it

	wear or burn c.Injector hole is blocked up d.Needle valve locking	
12.Faults of speed governor	1. Speed instability a.Cylinders oil supply is not uniform b.Oil injector hole blocks up c.Springs of oil pump plunger and output oil valve are broken 2.Idle speed can not be reached a.Controlling arm can not be placed completely b.Gear ring locks with adjusting gear rod 3.Traveling block a.Regulating spring become deformed for using a long time b.Distance of fly hammer opening and folding is inconsistent c.Wear clearance is too large of the floating rod 4.Engine runaway a.Over speed rotary b.Regulating spring is broken c.Controlling gear rod locks with gear ring	1. a.Adjust oil supply quantity b.Check or replace the injector assembly c.Replace spring 2. a.Check and adjust b.Check and adjust 3. a.Replace spring b.Check and adjust c.Check and repair 4. a.Check and adjust again b.Replace spring c.Check and repair
13.Engine stops working suddenly	1.Crankshaft can not move after the engine stop working a.Crankshaft locks with bearing b.Piston locks with cylinder liner 2.Crankshaft can move easily after the engine stops working a.The fuel system has air b.Fuel system blocks up c.Air filter blocks up	1. a.Check the crankshaft and bearing and repair them b.Replace piston and cylinder liner 2. a.Release the air b.Remove the blockage c.Maintain the air filter
14.Starter faults	1.The starter does not work a.Poor connection of circuit b.Shortage electricity of charging c.Poor contacting of electrical brush d.Starter cuts off the the circuits by itself 2.Starter has no power in neutral starting situation a.Bearing insert is wore b.Poor contacting of electrical brush c.Commutator is not clean or singeing d.Terminal weld is loosen e.Poor contact f.Poor contact of switch g.Battery charging is not enough or capacity is too small h.Friction clutch slip 3.Gear returning is difficult a.Switch contactor fusing cement	1. a.Clean and tighten the contact points b.Charge or replace the battery c.Clean the commutator surface d.Repair 2. a.Replace a new bearing insert b.Clean the commutator surface c.Clean oil dirt and polish with fine emery cloth d.Reweld e.Clean and tighten the contact points f.Check the switch g.Charge or replace the battery h.Adjust the clutch torque 3. a.Repair the switch
15. Generator faults	1.No charging 2.Adequate charging 3.Over charging	The four items can be removed according to characteristics of different generators

	4.Charging current is not stable	
II. Transmission Controlling rod slips and the valve piston is not engagement	Controlling rod is adjusted incorrectly or not connected at all	Adjust connection
2. Shift pressure is too low of all gears	1.Oil level is too low 2.Fault of controlling pump 3.Fault of shift pressure	1.Fill oil to specified pressure 2.Please contact to Customer Service Department of our company 3.Please contact to Customer Service Department of our company
3.Shift pressure is too low of someone gear	Seal parts, piston ring and gear clutch are wore or broken	Please contact to Customer Service Department of our company
4.Oil temperature is too high	1.Oil level is too low 2.Oil cooler sink is dirty 3.Long time driving with high or low gear position 4.Fault of torque converter safety valve	1.Fill oil to the highest level 2.Clean the cooler sink 3.If choose the different gears grades to drive, please change the driving ways 4.Please contact to Customer Service Department of our company
III.Brake 1. Brake lining is not separated from the brake drum completely	Return spring is broken or no lining	Repair or replace spare spring (Customer Service Department)
2.Brake failure	1.Brake system has air 2.Oil leakage at brake pipe joints 3.Oil leakage at sealing of wheel brake sub pump 4.Brake lining is damaged or wore	1.Release air of the brake system 2.Tighten joints and replace sealing parts 3.Replace sealing parts (Customer Service Department) 4.Replace the whole brake and lining
IV.Hydraulic steering 1.Hydraulic steering gear and pump is damaged		Contact to our Customer Service Department
2. Front wheel oscillation	Steering cylinder or rod bearing is wore	Replace a new bearing or corresponding ball bearing
V.Operating devices 1. Controlling of operating devices failure or can not maintain the selected location	1.Little oil in the hydraulic oil tank 2.Piston sealing part of the cylinder is broken 3.Incorrect adjusting pressure of safety valve 4.Safety valve can not keep the required pressure	1.Fill oil to specified level 2.Replace sealing parts (Customer Service Department) 3.Readjust (Customer Service Department) 4.Replace the spring or valve (Customer Service Department)
2. Blade oscillation	Clearance of the guide is too large	Replace and polish the guide plate lining
3. Blade can not rotary	1.Oil leakage of hydraulic motor joint 2.Parts of hydraulic motor are wore	1.Replace sealing parts 2.Replace the hydraulic motor (Customer Service Department)
4. Oil supply is inadequate and with large noise of	1.Little oil in the hydraulic oil tank 2.Hydraulic oil pump is damaged	1.Fill oil to specified level 2.Replace the hydraulic pump (Customer Service Department)

hydraulic oil pump		
5. Controlling rod can not return to the middle position automatically	The return spring is too soft or broken	Replace the return spring (Customer Service Department)
VI. Electrical system 1. Light is not working	1. Lamp bulb is broken 2. Fuse is burned off	1. Replace the lamp bulb 2. Replace the fuse
2. Electrical devices are not work	1. Fuse is burned off 2. Fault of electrical devices	1. Replace the fuse 2. Replace the electrical devices (Customer Service Department)

CHAPTER VI SAFETY RULES

Section 1 Safety rules for motor grader operating

1. Towing

If the motor grader is needed to tow, put the gear rod in neutral position. The engine should work if it is possible so that the steering and brake assistant devices are still effective. If the motor grader is towed by wire ropes, please ensure that nobody stay between the motor grader and tractor.

2. Starting by towing

It is impossible to start the machine by towing because of the torque converter. Starting by towing will damage the gearbox.

3. Working slope

In order to avoid the engine lack of lubrication, the grader work slope should not beyond the following range. Poor lubrication will damage the engine.

	Cross slope	Longitudinal slope	
	Left or right	Forward	Backward
Range	20°	25°	25°

Section 2 Safety rules of maintenance and repair

1. Place the motor grader levelly on hard ground.
2. Make the operation devices (blade and bulldozing plate) to the ground.
3. Pull the hand brake.
4. Plug in the safety rod and fix the articulated steering system of the motor grader.
5. Please kill the engine and do not ignore it. Only one kind of situation exception in which maintenance must require to carry out the engine.
6. If the operating devices must be lifted, please fasten the support.
7. Fix the suspended device above the motor grader.
8. It is strictly prohibited to tighten the joint when the hydraulic system is under pressure.
9. Keep the fender clean to prevent slipping injuries.
10. Restoration all the fasteners (cotter pins, spring collars and etc.) after maintenance.

Section 3 Safety rules of transportation and handling

Road and rail transportation

- A. Make the articulated frame straightly, adjust the front wheel to vertical, put down the blade and bulldozing plate in suitable position when transport it.
- B. Fix the wheels to prevent the grader slide and tie up to the transport tool.



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