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Operation and Maintenance Manual and User Service Guide for Industrial Power WP4/WP6 Series Diesel Engines

WEICHAI

WEICHAI POWER CO., LTD.
www.weichai.com

PREFACE

Industrial power covers six large industries: generation power for land use, generation power for marine, generation power for marine in emergency case, pump power, air compressor power and fixation power for other purposes.

On the basis of 226B-4/226B-6 series diesel engines, industrial power WP4/WP6 series diesel engines, as special powers, are independently researched and developed by our company for meeting stricter emission requirements. This series of diesel engines have such features as compact structure, reliable operation, advanced economic technical index, quick startup, easy operation and convenient maintenance etc. This series of diesel engine are not limited to use for power generation, and the other application domains are not covered by this manual.

This manual describes the operation and maintenance, inspection essentials and service guide for industrial power WP4/WP6 series diesels, and can be used as reference.

In order for the industrial power WP4/WP6 series diesel engines to better service and give full play to its effectiveness, the users are expected to carefully read and learn the diesel engine structure, maintenance and operation methods. The useful life of diesel engine can be greatly prolonged if the users can follow this manual for maintenance.

As the industrial power WP4/WP6 series diesel engines have increasingly models and been improved, users are expected to timely pay attention to the technical information issued by our company. This manual will be subjected to modify without any prior notification. To obtain more information, users (or sales) should log in the website www.weichai.com.

June, 2013

Notice

1. Before delivery, this series of diesel engines have already been tested, strictly following the test specification. Therefore, never dismantle the lead sealing on the throttle to raise its openness; never dismantle or impact the rotor of turbocharger which belongs to the sophisticated parts; never loosen or remove the main bearings of diesel engine and bolts attached to the connecting rod which have strict requirements for torque and angles. Otherwise, our factory will not perform the "Three-guarantee". Hope the user pay attention to it.

2. As the bolts attached to connecting rod are disposable, never reuse them.

3. The operator of diesel engine should carefully read this Operation and Maintenance Manual, be familiar with the structure of the diesel engines and closely abide by the technical operation and maintenance procedures specified in this manual.

4. At any time of starting the diesel engine, please check whether the coolant and engine oil is filled up.

5. For the new diesel engine, 50h running-in is needed, with maximum load not more than 80% of the rated load and average load not more than 60%.

6. The starting time of the engine should not last for more than 30s. If the engine can't be started within 30s, wait for 1-2min for startup again.

7. After the diesel engine is cold started, please slowly increase the rotating speed, do not make high-speed operation suddenly and never idle running for long time. After engine running with heavy load, do not immediately stop it. It is necessary to idle running for 5-10 min at low speed.

8. After engine is stopped, if the ambient temperature is less than 0℃, moreover the antifreeze additive is not applied; please completely drain the water in radiator and diesel engine.

9. The diesel engine is prohibited to work without air filter which could prevent the air not to be filtrated from entering the cylinder.

10. Please select the specified fuel and oil grades which will be filled into the diesel engine (it is suggested to use the Weichai special oil sold at all service stations of Weichai when change the lubricating oil). Use the special clean container. The fuel and oil should be filtrated through the strainer before added. Let the fuel precipitate for 72h or more.

11. Do not simultaneously use the diethyl-ether-assisted starting equipment and flame pre-heater or glow plug.

12. The inspection of electrical system should be done by the personnel mastering the electrical knowledge.

13. The invalid duration of oil sealing of diesel engine is one year. If they expire, please take necessary supplement measures.

14. Our company perform the quality-trace filing for industrial power WP4/WP6 series diesels engine, therefore users are expected to fill the card and then send it back to our company. Keep relation with our user by this card.

June, 2013

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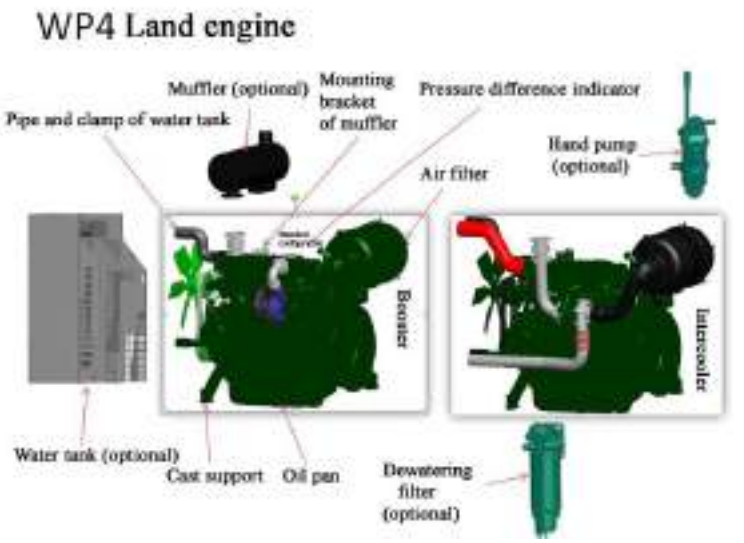
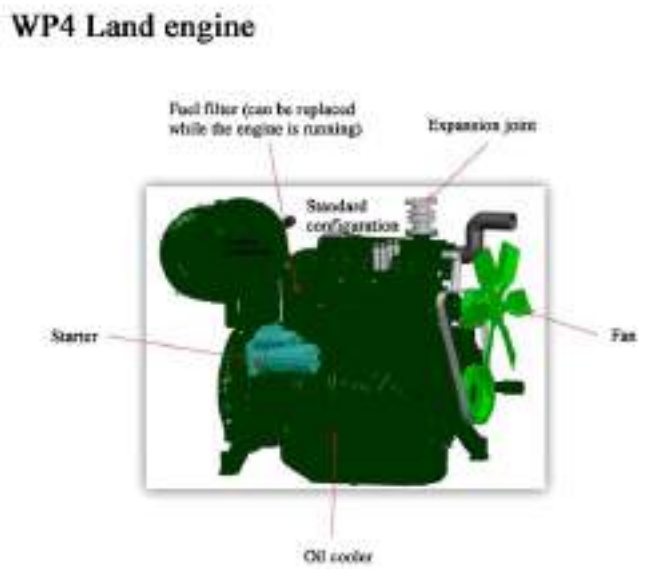
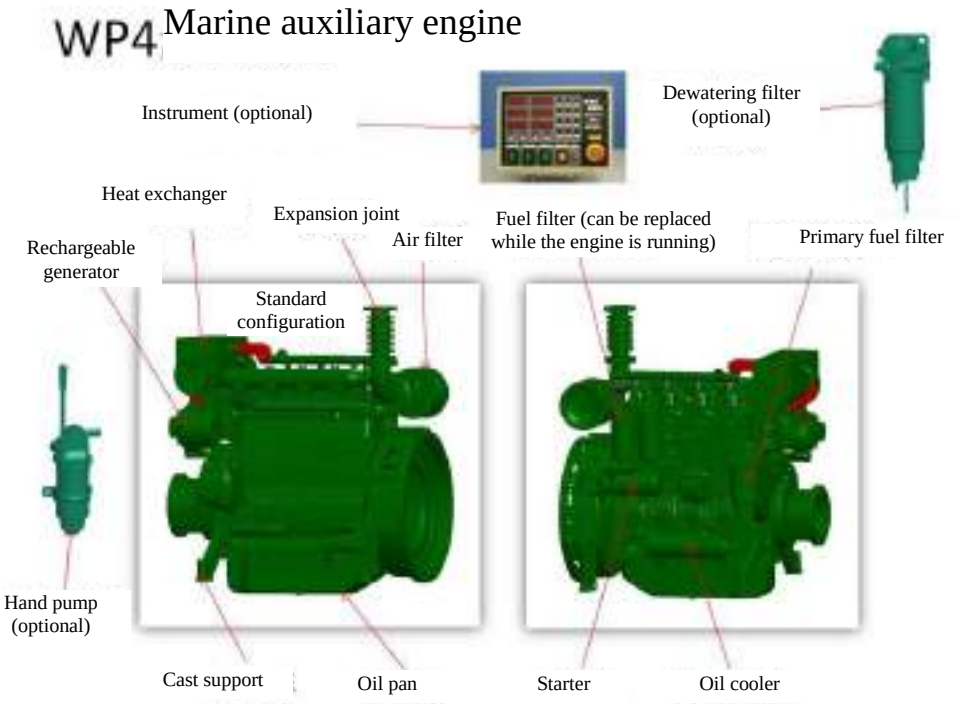
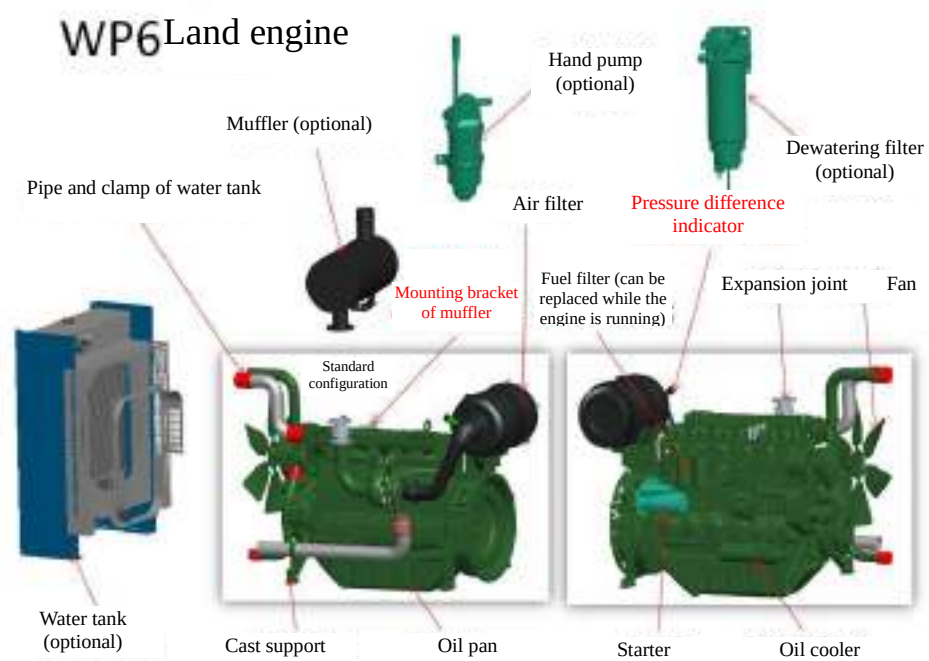




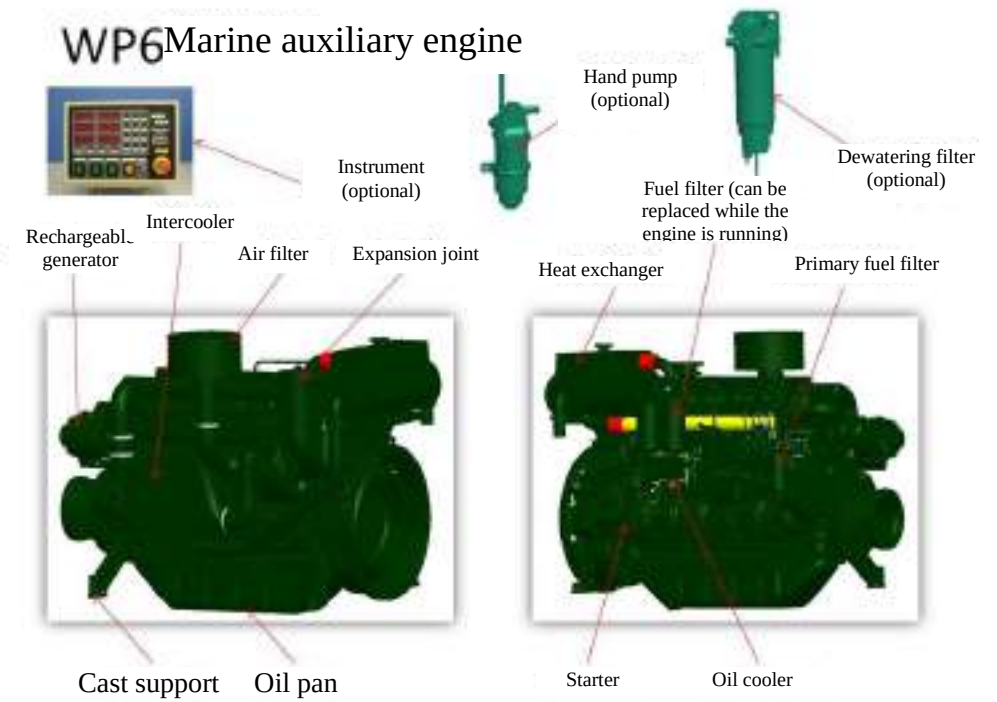
Schematic for WP4 series land diesel engine



Schematic for WP4 series marine diesel engine



Schematic for WP6 series land diesel engine



Schematic for WP6 series marine diesel engine

1. Fuel, lubricating oil and coolant used for diesel engine

1.1 Oil

1.1.1 Quality grade

Refer to the quality and feature to divide the oil into API and GB standards. Engine oil allowed to be used:

API grade: CF-4 and CH-4

GB grade: CF-4 and CH-4

It is allowed to use the oil with higher quality grade to instead of engine oil with lower quality grade.

1.1.2 Oil viscosity

Refer to table 1-1 for selection of oil viscosity.

Table 1-1 The relation between oil viscosity and ambient temperature

	SAE Viscosity grade	Ambient temperature (℃)
Lubricant	5W/30	–30-35
	10W/30	–25-35
	15W/40	–20-40
	20W/50	–15-50

Notice: Before starting of diesel engine, thoroughly check the oil level in the oil pin.

Do not check engine oil level with engine running.

It is not allowed to mix different grades of oil.

Suggestion:

It is recommended to use the Weichai special oil, which is mixed by the imported quality basic oil and selected additive. This oil is sold at all the service stations of Weichai at the unified national sale price.

1.2. Fuel

1.2.1 The diesel engine uses the light diesel as the fuel;

1.2.2 Quality grade

Sulfur content in the fuel with specified grade should not be higher than 1%.

It is allowed to use the following diesel fuels:

-GB252 0，－10，－20，－35，－50

-DIN 51601

-NATO CODES F54，F57，F76

-BS 2869：A1，A2(for A2, pay attention to the sulfur content)

-ASTM D975-81：1-D，2-D

-W-F-800C：DF-A，DF-1，DF-2

• Apply the following grades of diesel fuel based on the ambient temperature.

If the ambient temperature is higher than 5℃, it is recommended to use the 0# diesel fuel (GB 252-94)

At low temperature, the diesel fuel may precipitate the waxy material, leading to poor mobility of diesel fuel. In such case, the fuel system will be clogged, causing failures of diesel engine. **Therefore, if the ambient temperature is less than 0℃, please use the diesel fuel suitable for winter. According to the GB252 diesel oil standards, if the ambient temperature is -5℃ or more, please choose the -10# diesel fuel. If the ambient temperature is -14℃ or more, please choose the -20# diesel fuel. If the ambient temperature is -29℃ or more, please choose the -35# diesel fuel. If the ambient temperature is -44℃ or more, please choose the -50# diesel fuel.**

1.3 Coolant

1.3.1 Coolant must be filled in the cooling system of diesel engine

The industrial power engine requires the coolant, which is glycol type for heavy-duty diesel engine, should have such features as antifreeze, anticorrosion and scale proofing, as well as high boiling point.

Coolant classification

Coolant are classified into two grades according to the engine loads:

a. Coolant for light-duty engine

b. Coolant for heavy-duty engine

1.3.2 Select coolant correctly

User could select different kinds of coolant depending on the ambient temperature. Generally, the antifreeze selection standard is to be lower than ambient temperature by 10℃.Never use the untreated water as the coolant.

Relation between the freezing point of coolant and mass fraction of glycol

Freezing point of coolant /℃	Mass fraction of glycol (%)	Mass fraction of water (%)	Density/(kg.m-3)
–10	26.4	73.6	1.0340
–20	36.2	63.8	1.0506
–30	45.6	54.4	1.0627
–40	52.3	47.7	1.0713
–50	58.0	42.0	1.0780
–60	63.1	36.9	1.0833

1.3.3 Correct use of coolant

a. Do not fill the coolant too quick. Otherwise, the gas in the engine cannot be drained easily. It is better to keep the filling speed at 13.5L/min.

b. Do not fill the radiator up for the first time. Start engine to let its temperature rise in idle speed, then check the coolant level again. Refill it, if necessary.

c. The concentration of antifreeze should be inspected every 1000h. The antifreeze should be changed every two years to avoid corrosion.

d. Each time of maintenance or starting engine, check coolant level and leakage.

e. Avoid continuously running diesel engine with coolant temperature lower than 60℃or higher than 100℃. If above situations occur, find out the cause and resolve it.

Suggestion:

It is recommended to use the Weichai Power heavy-duty engine coolant which is sold at all service stations at the unified national sale price.

1.4 Disposal of used oil/fuel/coolant

Use the special container to collect the waste oil. As the oil, fuel and coolant is toxic, neither drink nor connect with skin.

2. Installation and connection of diesel engine

2.1 Hoisting of diesel engine

Hoist diesel engine incorrectly will lead to damage in the process of hoisting.

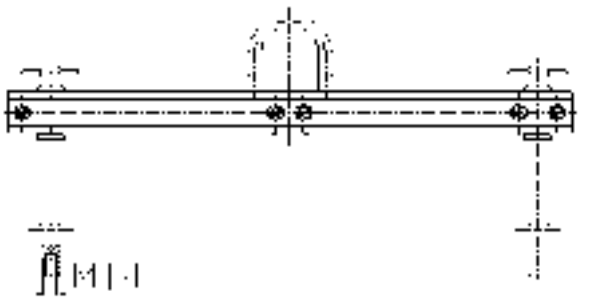


Figure A

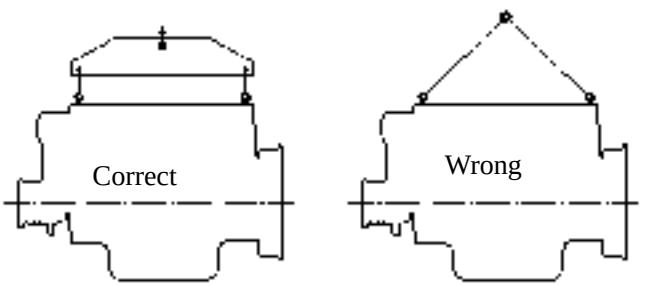


Figure B

There are 2 special bolts on the cylinder head in each diesel engine for hoisting. On the head of hexagon bolt there is a screw rod with M14 hole for mounting hoisting device or lugs (see figure A). When using the special hoisting device, screw the rods with the 2 bolts respectively, adjust the center of gravity, then the engine can be hoisted. In case of hoisting by lugs on the 2 bolts, it is recommended to use device as shown in figure B. When the engine is hoisted, the crankshaft shall be horizontal and the two hoisting ropes are parallel. It is better not to use one rope in a triangle shape as shown in the right one of figure B. As the rope, bolts and lugs are out of a straight line, the bolts in cylinder head may be damaged or even broken, causing damage to the diesel engine.

2.2 Installation of diesel engine

The diesel engine shall be installed with flexible connections and ensure the central line of crankshaft shares an axis with transmission devices (gear box, transmission box) and the crankshaft bears no axial force caused by the installation.

2.3 Installation of exterior system of diesel engine

The exhaust pipes shall be as straight as possible. There shall be expansion joints in the middle of the pipe; the pipeline shall be supported additionally; the inner diameter of the exhaust pipeline shall be not less than 83mm with exhaust back pressure not greater than 6kPa.

The outdoor exhaust pipe shall be covered with rain shield. To facilitate the release of water in the pipe, install a water drain plug at the lowest position of the exhaust pipe.

The outdoor intake port shall be installed with a waterproof cap to prevent rainwater entering the intake system.

The capacity of fuel tank shall support the diesel engine for 8-hour running in rated conditions. The outlet of the fuel tank shall be not lower than the inlet of injection pump of oil supply pump. Inner diameter of fuel pipeline shall be not less than 12mm.

3. Precautions and operational requirements for diesel engine

3.1 Preparation for operation

3.1.1 Unsealing

After the diesel engine is unpacked, user should firstly refer to the packing list to check the diesel engine and accessories, to check whether there is damage on the surface of diesel engine and whether the connector are loosened, then perform the following procedures:

a. Wipe the antirust coat and anticorrosive agent on the exposed parts.

b. Drain the sealing oil in the fuel filter and parts of the fuel system (it is allowed to start the engine with the sealing oil not drained. But it is prohibited to load the engine until the sealing oil is completely consumed and diesel oil begins to be supplied.)

c. Check whether the coolant/oil plugs are in good state and whether the water/oil temperature sensors are supplied. In addition, any part provided by the user should be installed.

Note: Do not start the diesel engine until it is correctly installed and connected. If diesel engine runs in enclosed room, ventilation must be conducted to ensure the exhaust is drained to the outside.

3.1.2 Filling engine oil

a. Engine oil should meet the requirements. If not, oil pressure may be insufficient, which can lead to the wear and difficult startup. It is essential to keep the engine oil clean.

b. Tighten the oil drain plug.

c. Open the oil filler cap to fill the engine oil which should be filtrated by a mesh.

d. Diesel engine should be placed horizontally; take out the dipstick to check the oil level. Add oil to the upper limit of the dipstick if necessary. Recommend amount for P4 model is 10L while for P6 model is 14L.

e. Tighten the oil filler cap.

Note: At each time of starting diesel engine, check the engine oil level.

3.1.3 Filling fuel

a. The used diesel oil should meet the specifications.

b. Keep the diesel oil clean, and the diesel oil should be sedimentated at least 72h and then filled into the fuel tank through the built-in mesh.

Note: At each time of starting diesel engine, check the diesel oil level.

3.1.4 Air bleeding of fuel system

a. Loosen the screw at the outlet of fuel supply pump by half circle. Repeat pressing down the hand pump until the diesel emerges, then tighten the screw.

b. Loosen the air bleeding screw on the fuel filter. Repeat pressing down the hand pump until the diesel emerges, then tighten the air bleeding screw.

c. Loosen the air bleeding screw on the fuel injection pump. Repeat pressing down the hand pump until the diesel emerges, then tighten the air bleeding screw.

d. Continue to pump the hand pump to check whether the fuel pipe leaks, then tighten the hand pump.

3.1.5 Filling coolant

Coolant is formulated by the softened clean water and anticorrosive agent or antifreezing agent, which should strictly follow the regulations from additive manufacturer.

The coolant should be filled via the inlet of radiator and heat exchanger to drain the air in the cooling system.

Note: At each time of starting diesel engine, check the coolant level.

3.2. Operation precautions

3.2.1 Rotate the crankshaft for several rounds before startup and make sure it rotates well, then place the speed adjuster of the injection pump in the middle and switch on power.

3.2.2 If the diesel engine is not started within 5s, immediately release the button, and then wait 1min for the second startup. If the engine could not be started for 3 consecutive times, please stop at once, troubleshoot for starting again.

3.2.3 After the diesel engine is successfully started, idle it for 2-3min and the oil pressure should not be less than 100kPa. Otherwise, stop the engine and find out the cause. If the cooling water is still less than 60℃, do not suddenly speed up and increase load, which otherwise impair the abrasive resistance and reliability.

3.2.4 Check the “three-leakage” after each operating.

3.2.5 Before loaded diesel engine stopping, please reduce the load and rpm, and idle it for 5～10min.Avoid stopping engine with full load.

3.2.6 Engine oil level inspection: it is correct to check the oil level 5min after engine is stopped.

Caution: To avoid from damage the diesel engine, the cable to the voltage adjuster of diesel engine and the cable to the positive pole of battery shall not be removed during the running. Different from DC generator, it is prohibited to check voltage of the alternator via temporary grounding.

3.3 Engine Stopping

3.3.1 The engine shall not stop with full load. Before stopping, reduce the load and speed and idle speed for 5-10min. In case of manual shut-down, press down the brake lever till the flywheels stops or the speed indicated in the instrument is zero.

3.3.2 For diesel engine without anti-freeze liquid in the circulating water, the cooling water shall be drained off in cold weather so as not to damage the engine. Screw off the drain valve at the bottom of the fuel cooler to drain off the water; at the same time, screw off the plug on the top of the radiator to drain off water in it.

3.4 Operational environment

If the ambient temperature is higher than －15℃, the diesel engine can be normally started. If the ambient temperature is within －15℃-35℃, some assistant equipments should be used for normal startup. If the diesel engines are used in high-altitude or hot regions, power of diesel engine will drop. As the diesel engine is not explosion-proof, its operational environment should be free of inflammable and explosive.

4. Maintenance specifications for industrial engines

Maintenance intervals and specifications of industrial engines are suitable for P4, P6, 10L, 12L, 13L and Baudouin series products.

4.1 Maintenance intervals and specifications of industrial engines

4.1.1 Maintenance intervals of industrial diesel engines

Initial maintenance (P)	The new engine running 30-50h	
Level 1 maintenance (WD1)	Diesel engine working interval	250h
Level 2 maintenance (WD2)	Diesel engine working interval	500h
Level 3 maintenance (WD3)	Diesel engine working interval	1000h
Level 4 maintenance (WD4)	Diesel engine working interval	3000h

4.1.2 Daily maintenance for diesel engine

a. With diesel engine running, always notice that the oil temperature, oil pressure and coolant temperature at outlet, and check for “three-leakage” (oil, gas and water). In case of any abnormal, find out the cause and troubleshoot.

b. After the diesel engine is stopped, check the fuel, fresh-water coolant and oil capacity, refill it if necessary.

c. Drain the moisture in the stage-one fuel filter.

d. Check the tension of belts, adjust it if necessary.

e. If the ambient temperature is less than 0 ℃, and the diesel engine is not filled with antifreeze, drain the coolant to prevent the diesel engine parts from being froze.

f. Check oil level in the fuel injection pump and governor, refill it properly if necessary.

4.1.3 Inspection and maintenance for diesel engines.

Items	Initial maintenance	Routine	WD1	WD2	WD3	WD4
Replace diesel oil and engine oil filter element	▲		▲	▲	▲	▲
Replace fuel filter.			▲	▲	▲	▲
Check and adjust valve clearance.	▲		▲	▲	▲	▲
Check the coolant level and refill if necessary.	▲	▲	▲	▲	▲	▲
Check the coolant pump for leakage	▲		▲	▲	▲	▲
Clean strainer of fuel pump			▲	▲	▲	▲
Tighten the intake pipe and hose	▲		▲	▲	▲	▲
Clean the oil cooler elements					▲	▲
Clean the intercooler elements					▲	▲
Clean the fan and radiator					▲	▲
Replace or clean air cleaner element.				▲	▲	▲
Check and tighten the belt	▲	▲	▲	▲	▲	▲
Check the fuel injection pump at the service stations						▲

Note: ▲ means items needed to be maintained.

Explanation: The maintenance intervals are based on the diesel engine running for 1500h each year. If the diesel engine works for 500h or less each year, its maintenance intervals should be 1/2 of ones in above table.

4.1.4 Spare parts and oil/fuel grade specifications

It is suggested for the users to purchase the special spare parts and oil (CF-4, 15W-40) from Weichai special service stations which can ensure engine works normally, prolonging its service life.

4.1.5 Maintenance Instruction

In case of any failure within the period of "three- guaranty", timely call 400-618-3066, and then the call center will arrange Weichai special service center for inspection and repair at once. Weichai will bear no responsibility in case of failures caused by using special spare parts or oil not from the Weichai or maintenance not done at Weichai special service station.

4.2 Maintenance intervals and specifications of industrial gas engine

4.2.1 Maintenance intervals of industrial gas engine

Initial maintenance (P)	New engine running 30-50h
Level 1 maintenance (WD1)	Diesel engine working interval 250h
Level 2 maintenance (WD2)	Diesel engine working interval 500h
Level 3 maintenance (WD3)	Diesel engine working interval 1000h
Level 4 maintenance (WD4)	Diesel engine working interval 3000h

4.2.2 Maintenance for gas engine

Items	Maintenance content	Maintenance mileage
Conventional inspection:	Oil level; coolant level; drive belt for wear; cooling fan for damage; gas supply system for leakage; hot water filled in gas supply system for cycle normal; electrical system for reliability; air cleaner for looseness.	Refer to the routine inspection and maintenance intervals. Refer to 1-level maintenance for the WD2, WD3 and WD4 maintenance. Use the Weichai-special oil and accessories for the user of engine oil and oil filter.
Initially mandatory maintenance	Replace the oil and oil filter element; check the belt tension, pipeline clamp, bolt tension and bolt attached to the cylinders.	
Routine inspection	Fuel filter; each clamp of pipeline (coolant pipe, air pipeline, fuel line and oil pipe); fuel system for leakage and pressure.	
WD1 maintenance	Valve clearance; air cleaner; belt tension, each clamp of pipeline (coolant pipeline, air pipe, fuel line and oil line); spark plug; high-pressure wire; ignition advance angle; fuel filter element and coolant level.	
WD2 maintenance	Replace the service kit of voltage stabilizer; clean the mixer, electronic throttle and injector.	
WD3 maintenance	Check the high-voltage wire of spark plug and it is suggested to replace it.	
WD4 maintenance	Check the supercharger, air compressor; clean the cooling system; replace the coolant; replace the service kit of pressure reducer.	

4.2.3 Spare parts and oil/fuel grade specifications

It is suggested for the users to purchasing the special spare parts and gas from Weichai special service stations, which can ensure engine works normally, prolonging its service life.

4.2.4 Maintenance Instruction

After the Weichai industrial engines are installed, user is expected to notify the Weichai special service center for commissioning. In case of any failure happening within “three-guaranty”, timely notify the Weichai special service center.

Friendly reminder:

a. Please carefully read the maintenance instruction for your legitimate interest.

b. Weichai will take no responsibility in case of failures caused by using special spare parts or oil not special supplied by Weichai or maintenance not done at Weichai special service station.

c. Weichai will take no responsibility in case of any failure caused by using engine for other purposes or mismatching the engine parts.

5 Main maintenance specifications for accessories of diesel engine

5.1 Use and maintenance of fuel injection pump

5.1.1 Preparation for operation

a. Check whether the pump model is correct before installing the fuel injection pump, replace it if not.

b. Wipe the antirust oil on the surface of fuel injection pump.

c. Clean the antirust oil inside of governor and fuel injection pump, and then refill the lubricant with stipulated grade.

d. Antirust oil in fuel pipe should be removed before using, then fill the pipe connected to the fuel injection pump with fuel, and continuously crank the camshaft of fuel injection pump until the clean fuel is rejected from the fuel outlet valve.

5.1.2 Fuel

Using the inferior fuel not only could reduce the engine performance, but also could greatly shorten the service life of fuel injection pump and engine.

a. Use the high-quality fuel. Generally, 0# light diesel is used in summer and -10# or higher grade light diesel in winter.

b. The fuel should be clean, without any foreign material and moisture. Therefore, fuel should be sedimentated for 72h or more. Periodically clean the filter element and fuel supply pump mesh. In addition, timely change if there is any damage.

c. As the air mixed in fuel can hinder the fuel injection pump to work normally, drain the air entering the pump and low-pressure fuel pipeline if the fuel injection pump is not used for long time or fuel pipe joint is replaced. For draining air, loosen the overflow valve joint, repeat pressing down the hand pump. After that, timely tighten the overflow valve joint.

5.1.3 Lubricant

a. Generally, fuel injection pump is forcefully lubricated by connecting with engine lubricating system which can provide the lubricant. The new fuel injection pump should be filled with proper lubricant before being put into use, because it cannot be lubricated before engine provides the lubricant. Refer to the engine maintenance interval to service the fuel injection pump by loosening the bolts at the back housing to drain the used lubricant. After that, tighten the bolts and refill the new lubricant.

b. For the fuel injection pump non-forcedly lubricated (for example: P9 series oil pump), fill it with the stipulated-grade oil to the proper level measured by a dipstick. That can lubricate the fuel injection pump, with engine running. Refer to the engine maintenance interval to service the fuel injection pump by loosening the bolts at the back housing to drain the used lubricant. After that, tighten the bolts and refill the new lubricant.

5.1.4 Adjust the fuel injection advance angle

After the fuel injection pump is installed, refer to the engine requirements to adjust the fuel injection advance angle. Namely, 1st piston of cylinder should be at optimal injection position before reaching top compression dead center. Loosen the high-pressure fuel pipe of 1st cylinder, and loosen fastening bolt in fuel injection flange and adjusting bolt of coupling. Remote the fuel injection pump or camshaft of fuel injection pumps to check when oil flowing into the 1st cylinder, meanwhile, checks the flywheel scale. Adjust fuel injection advance angle according to requirements, and then tighten the loosened bolts and joints.

5.1.5 Sealing

When the fuel injection pump is not used for long time, antirust treatment should be done. Change the fuel and lubricant in the pump with antirust oil, cover the joint of fuel/oil return pipe and reseal it once very year.

5.1.6 Precautions

a. Without some experience and testing conditions, it is prohibited to dismantle the fuel injection pump assembly, especially, the lead sealing parts which cannot be unsealed.

b. The fuel injection pump should be stored in the vent and dry garage and kept away from the chemical goods which can lead to corrosion and rust, such as battery and acid.

5.2 Use and maintenance of supercharger

The engine oil of the supercharger flows out from the main oil gallery of engine to lubricate and cool the supercharger, then return back to the lower portion of crankcase.

a. Good lubrication is essential to the supercharger. The oil filter element should be periodically cleaned or replaced.

b As the supercharger works at extreme-high rpm (about 70000～100000r/min), idle the diesel engine after being started for about 5min and then load it. Do not suddenly stop diesel engine at high load or speed, whereas, it is correct to gradually reduce the load and rpm and then idle for 3-5min. otherwise, supercharger bearing may be damaged or fail.

c. Periodically remove and check the air compressor housing and turbine case, and clean the flow channel between impeller and housing. . Refill the clean oil at the oil inlet for reassembly of supercharger.

d. Precaution: As the rotor of supercharger is accurate high-speed rotating part, users are not allowed to dismantle or impact it. Otherwise, the factory guarantee will be invalid.

5.3 Use and maintenance of air compressor.

The air compressor for WP4/WP6 series diesel engine is of single-cylinder reciprocating-type crank and connecting rod structure, which is driven by the belt or gear.

a. The lubricant of air compressor flows from the main oil galley to the lubricating bearing in the air compressor via the lubricant pipeline, and eventually to the oil pan via the timing gear chamber.

b. Before entering the air compressor, the air has been filtrated. Then the filtrated air flows out of the air cleaner and into the air compressor before getting in the supercharger.

5.4 Use and maintenance of water pump

Water pump for WP4/WP6 series diesel engine is installed in the front of engine and the water pump volute is on the upper of the timing gear chamber. The water flow out the volute to the right water chamber through a intermediate block and then flow into the sandwich of cylinder from the lower right of the engine body to cool the cylinder, then it comes to the water chamber of cylinder head to cool the cylinder head, finally the water comes out from the outlet of cylinder head and comes into outlet pipe where there is a thermostat at the end. There are two outlets on the thermostat: one is connected to the radiator and the other to the inlet of water pump which is also called as minor circulation. When cooling water reaches 75±2℃, the thermostat will start and be fully opened with cooling water at 90℃. In such case, the entire cooling water after flowing though the radiator for cooling will be pumped into engine. However, when the temperature of cooling water is less than 75±2℃, thermostat will cut off abovementioned passage, making the cooling water directly though the inlet of water pump and accordingly heat the engine rapidly until the required thermal state is reached. Therefore, that can prevent the wear at low temperature and prolong the useful life of diesel engine. In case of any leakage in water pump replace the seal.

5.5. Use and maintenance of starter

a. Starter, as a short-time working part, should work for 15s at most. In addition, the starting interval should be more than 30s.

b. In winter, if ambient temperature is less than 5℃, preheat the engine before startup.

c. Release the starting switch the moment the engine is started, separating the drive gear of starter from the gear ring of flywheel.

d. Do not power the starter until the engine stands still, which can prevent the flywheel from impacting the starter gear.

e. The installation of starter must follow its wring drawing. Before removal of starter; ensure the battery is disconnected to the starting wire of starter.

f. Frequently check whether the fastener and wire insulation of starter are damaged, and whether the wire is well connected. In addition, remove the dirt.

5.6 Use and maintenance of generator

a. Reasonable matching: with engine idling, the generator should meet the electricity consumed by the all electrical equipments. The generator mismatching the electrical equipments could lead to lack of electricity in battery and generator overheating that could resulting in damage to governor and stator burning. Generator should have proper min. running rpm, because too-low working rpm. (Determined by the engine idling) also can lead to abovementioned failures.

b. Reliable fixing: generator should be correctly and reliably fixed on the engine. The bolts should be matched with the mounting hole of generator, and the pulley groove should share the same plane with the driving roller groove. The generator bracket should have sufficient rigid and strength, which otherwise may lead to damage to the generator.

c. Check the belt tension (shouldn't be neither tight nor too loose) by pressing down the middle part of it with force of 150N. It is optimal that the deflection is 10～20mm. Belt tension should be checked every two months. Belt slackening may lead to generator "idling", insufficient electricity production (that can result in lack of electricity in battery), stator burning and damage to bearing etc.

d. Generator should be kept away from the heat and splashed dirt. Splash should be avoided to enter the inside of generator, which otherwise can damage to it. Therefore, generator should be given a good applicant environment.

e. Working temperature of the generator is -40～93℃. Therefore, installation should be kept away from any heat source (distance of 400mm at least, or effective insulation plate should be installed), which should be approved by the generator factory or supplier.

f. The wire of generator should be rational, and wiring should be correct and reliable. Each terminal of generator should be correctly connected for fear that the harness burns or generator is damaged. Proper wire diameter is the premise of generator capable to fully output the generated electricity, and the base of electrical safety.

g. Before removing the generator and welding on engines, disconnect the battery to the generator. Generator removal, installation and repair should be done by the professional. Check whether all insulations are good, and immediately replace any damaged one. The positive pole of generator should be short connected to the housing to avoid series failure.

h. After the engine is started, slowly increase its rpm and observe whether the charging indicator changes from ON to OFF, if not, timely find out the cause.

i. Check whether the negative pole of battery is grounded, which otherwise may damage to the generator and governor.

j. With generator running, never adopt “sparking” to check whether the generator can output electricity, which otherwise can burn the testing bulb or diode.

k. With the rectifier connected with stator winding, it is prohibited to use a megger or 220V AC power supply to check for insulation of generator.

l. The generator should be reliably connected to the battery. Moreover, suddenly disconnecting them will generate high voltage, damaging to the generator or governor.

m. To match the governor with the AC generator, the voltage grade and grounding type of AC generator should be same to those of governor. In addition, the governor power should be not be less than that of generator.

n. The wiring should be correct.

5.7 Use and maintenance of oil pump

Oil pump mounted on the WP4/WP6 diesel engine is of external gear pump. The two gears with same quantity of teeth could mesh with each other. The two-gear contrarotation and gear space should push the oil from the low-pressure chamber to the high-pressure chamber. The consecutive rotation of gear could continuously provide the each lubricating system with oil.

a. The oil pump performance is mainly dependent on the clearance between the gear in the oil pump and its housing (end clearance and radial clearance).Widened clearance can lead to oil leakage, reducing the pressure and amount of oil. Narrowed clearance should result in severe wear.

b. When the oil pressure drops, repair the oil pump if other failures are ruled out. To check the oil pump, firstly check whether there is leakage or burn happened to the oil pump. If not, firstly check the pressure-limiting valve, and then remove the oil pump. Check whether the pressure-limiting valve spring is softened, or whether the pump and end cover wear. If needed, replace the oil pump.

c. If the oil pressure is over high, dismantle and check the pressure-limiting valve, specially, whether the pressure-limiting valve can be open.

d. During removal and installation of oil pump, pay specially attention to the end cover, interface of pump body and each positioning pin.

5.8 Use and maintenance of air cleaner

Warning! Wrong maintenance method may greatly shorten the service life of engine.

a. The use of air cleaner should correctly follow the performance index of diesel engine, which otherwise may impair the diesel engine dynamic property and economy.

b. For the air cleaner with alarm, firstly check the alarm before diesel engine. When the intake resistance indicator becomes red, maintain the air cleaner filter.

c. For the filter with multi-stage filtration, the strainer must be installed.

d. During installation, avoid sharp corners and check for leakage.

e. Water is prohibited to enter the air cleaner.

f. For the air cleaner with safety element, it is prohibited to remove the safety element during maintenance of air cleaner.

g. Generally, the paper main element of the air cleaner should be maintained every 100-200h. The paper main element should be removed, and then slightly tapped or shaken to get the dust off. Check the sealings in each element and replace any damaged one. It is allowed to use the clean and dry compressed air with pressure less than 500kpa to blow the element from the outside to the inside. Place a lamp into the element to check whether the filter element is pervious to the light, whether there is crack, piercing or other damage. Never flush the main element with oil and water.

h. The main element should be replaced every 1000-2000h, together with the safety element.

i. In case of the following items, replace the filter element assembly:

-- The filter element is damaged.

-- After the filter element is cleaned, the alarm still sounds.

-- To replace the element after being cleaned for 3-6 times,

Select high-quality products to ensure the reliability of the diesel engine. Therefore, it is suggested to purchase original parts.

5.9 Use and maintenance of diesel filter

Diesel filter consists of strainer and fine filter. As the time goes by, the dirt or foreign material becomes increasingly accumulated on the filter element surface and bottom of housing, which can clog the element if it is not removed timely. As a result, diesel engine can not be provided with sufficient oil, reducing the power. Therefore, it is important to periodically maintain or clean the diesel filter.

a. Periodically open the drain plug at the bottom of housing to drain the dirty oil or accumulated water.

b. Generally, filter element should be maintained once every 200-300h, and shortened if the fuel quality is poor. During maintenance, timely replace any damaged filter element.

c. Before maintenance, chock the two holes on the main element to prevent any dirt from getting in. The filter element should be cleaned in clean kerosene and diesel using a soft brush. After that, use clean kerosene and diesel to clean it again. If conditions permit, use clean compressed air to blow it from the inside to the outside.

d. Use clean kerosene or diesel to clean the inside surface of housing and each hole of end cover.

e. Check if the sealing is damaged, if so, timely replace it.

f. After maintenance and before use, check if there is oil leakage around each sealing position.

5.10 Use and maintenance of fresh-water cooler

The fresh-water cooler mounted on WP4/WP6 series diesel engine is of shell-and-tube heat exchanger of which principle is that the seawater flowing in the coolant pipe cools the fresh water circuitously going in the inside of shell. Thus that can optimize the cooling conditions of diesel engine and then improve the useful life of diesel engine.

a. If the diesel engine is not in use, do drain the water in the fresh-water cooler, which otherwise is harmful to parts in fresh-water cooler, especially in winter.

b. The fresh-water cooler should be checked each quarter by cleaning the pipeline, removing the dirt and replacing the zinc slab.

c. Before reinstalling the fresh-water cooler already cleaned, hydrostatic test should be conducted. The installation can only be done if there is no leakage after the test lasts 30min under 0.4MPa of pressure.

5.11. Use and maintenance of air cooler

Air cooler mounted on WP4/WP6 series diesel engine is a tube-and-fin heat exchanger of which principle is that coolant flowing in tube could dissipate the thermal of air in supercharger via the tube wall. Therefore, it can reduce the intake temperature of diesel engine, increase the intake density and increase the power of diesel engine.

a. If the diesel engine is not in use, do drain the water in the air cooler. Otherwise it would be harmful to parts in air cooler, especially in winter.

b. The air cooler should be checked each quarter by smoothing the pipeline, removing the dirt and replacing the zinc slab.

c. Before re-installing the air cooler already cleaned, hydrostatic test should be conduct. As a result, there should be no leakage, after it is pressed with 0.4Mpa for 30min.

5.12 Use and Maintenance of electronic governor

The electronic governor mounted on WP4/WP6 series diesel engine consists of rpm controller, electromagnetic executor, rpm sensor, idling/rating switch, trimmer potentiometer; control power supply and power switch assembly. The principle will be explained as shown: idea rpm of engine is determined by the rpm setting potentiometer and rpm trimmer potentiometer. Whereas, the actual rpm of engine is determined by the rpm sensor mounted on the root of flywheel teeth. The signal outputted by the rpm sensor is of AC voltage signal with frequency in direct proportion to the rpm. This signal can be converted into the DC voltage via the F/V circuit, and then compared to the set value of RPM, as a result, the deviation value of rpm can be obtained. This deviation value is operationally amplified by the PID Ⅰ governor, which creates the fuel-supply position value, namely steady-state output position index of executor. After this index of executor is compared with the

actual position of executor, the actual position deflection can be obtained. Then the actual position defection is operationally amplified by PID Ⅱ governor, and then converted into the current control manner which can output the drive current to the executor and accordingly change the motion displacement of executor.

a. It is suggested to install the rpm sensor onto the gear ring of engine. In addition, the clearance between the sensor and teeth crest should be 0.4mm-0.8mm. Firstly rotate the sensor to the teeth crest and then return it back by 1/3 (pitch 1.5mm) or 1/2 circle (pitch 1mm), then tighten the nut. If there is no flywheel gear ring, use other sensing gear of which material must be permeability magnetic material. Moreover, within engine running rpm, the frequency output by the sensor should be not less than 1000Hz.

b. The electromagnetic executor is mounted on the engine and suggested to be installed together with fuel pump. But in special cases, external mounting type can be used.

c. The rpm controller should be installed in the protection case without any intense impact or electromagnetic interference. In addition, sufficient space should be reserved for installation, maintenance and thermal dissipation. The housing of rpm controller should be properly grounded. In addition, rpm sensor and rpm trimmer potentiometer should be connected to the controller by shield cable of which shielding layer should be grounded at one point of controller.

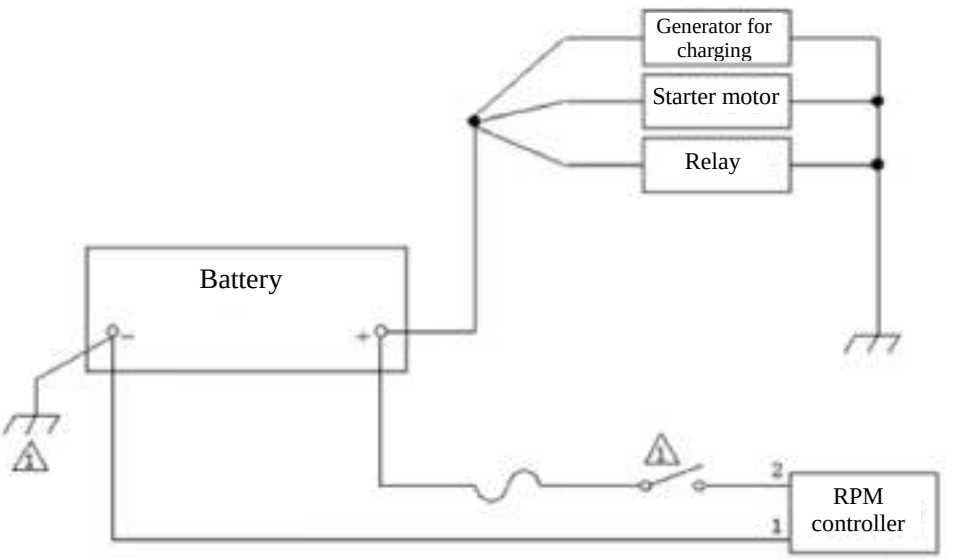
d. The governor has the working voltage of DC 24V (12V optional) and can be powered by the control battery of engine, starting battery or other regulated/non-regulated power supply, but the peak power consumption and voltage fluctuation of system should meet the related requirements. If the governor is powered by a starting battery, provide a charger and ensure the battery electricity is sufficient. With engine running, battery-output-voltage dropping for short time will not impair the normal working of governor.

e. Precautions for governor power supply wire:

The positive pole (pin2) of rpm controller on electronic governor should be connected to the positive pole of 24V battery via the switch of power supply (stopping switch) and fuse (if needed). Namely, the controlled is directly powered by the positive pole of battery.

The negative pole (pin1) of rpm controller on electronic governor should be directly connected to the negative pole of battery. If the negative pole of power supply is grounded, the negative pole of battery should be grounded at the negative pole of battery rather than at the negative pole (pin1) of controller.

If the power supply wire has length of less than 10m, its diameter should not be more than 0.75 mm^2 (include) and if the power supply wire has length of more than 10mm, thicken it.



f. Daily maintenance of electronic governor

Timely replace or repair any damaged cable. Cable should be clamped to prevent against rubbing engine. In addition, the layout of cable should be kept away from the high-temperature parts (such as supercharger and exhaust pipe).

Check whether the executor is reliably installed.

Check whether the executor connector, sensor connector and cable screws are contaminated with oil or loosened, if so, timely clean or tighten them.

Check whether the battery electricity is sufficient, or whether the charger is normal.

For the non-forced oil pump, frequently check the oil level in high/low-pressure chamber, and replace the lubricant on schedule.

If the engine is started at low temperature, finger to push the rocker arm of executor for a few times for feeling whether the motion is smooth.

Maintenance every 2000h: remove and clean the rpm sensor probe on which the dirt may be accumulated. Open the sightglass cover on the mid of governor to check whether the fasteners or pins attached coupling to the rack of oil pump are loosened, if so, timely tighten it.

Maintenance every 6000h: remove the executor from the high-pressure oil pump to check whether the rack of oil pump can move smoothly.

g. Precautions

The matched rpm sensor is only used for electronic governor rather than other rpm-metering devices.

To ensure the safety of engine system, the governing function of electronic governor can not be replaced by the overspeed protection function which should be independently installed.

The emergency-stopping executor of overspeed protection device should be independent and can not be replaced by the electromagnetic executor.

Each time of starting engine, please ensure the “idling/rating” rpm switch is at “idling” position.

The each potentiometer of controller has already well set at delivery and should not be adjusted by the non-professional.

With engine not running, it is not allowed to adjust (specially increase) the rated rpm of rpm controller, or to set the potentiometer or trimmer potentiometer. The set rpm should not be too high, which could lead to overspeed at the beginning of engine startup.

If the engine after being sealed for long time is to be reused or is started at low temperature, finger to push the rocker arm of executor for a few times for feeling whether the motion is smooth. If there is stuck phenomenon, do not start engine.

If the engine after being sealed for long time is to be reused, before startup, shortly connect the two probes of controller and then executor should output max. amount of fuel. The executor pointer should return back to zero the moment the two probes are disconnected. Otherwise, timely find out the cause, do not start engine rashly.

6. Common failure analysis and troubleshooting

6.1 Unable to start the diesel engine

S/N	Cause	Troubleshooting
1	Operation:	
	(1) For the air starter, the air pressure in the air bottle is insufficient or is not at the best starting position.	The starting pressure in the air bottle should frequently stay at 2Mpa. Before starting, crank the engine until any one piston reaches 15degree after the TDC.
	(2) For the electronic starter, the battery electricity is insufficient.	Refer to the service for free-maintenance battery
	(3) The driving handle is not at the driving position.	Fix the driving handle to the driving position.
	(4) Diesel engine is loaded	Unload the diesel engine
	(5) Oil viscosity is high, thus, the flowability is poor.	Refer to the ambient temperature to select proper oil, or heat oil.
	(6) There is air in the fuel system.	Deaerate the system
	(7) Water is mixed in the diesel.	Check the fuel tank, and then open the plug at the bottom of diesel filter for draining water.
	(8) The vent screw of fuel injector is not tightened, unable to inject fuel.	Clockwise rotate it.
	(9) Diesel is not properly selected.	Refer the local season for selection
2	Fuel system	
	(1) Fuel pipe joint leaked	Check and then tighten the joint
	(2) The fuel pipe is clogged	Check, clean or blow the clogging.
	(3) Diesel filter is clogged.	Replace or clean filter element
	(4). Fuel injector can not be well atomized.	Adjust and repair the fuel injector, if needed, replace the needle valve assembly.
	(5) Advance angle of fuel supply is wrong.	Adjust to specification
	(6) Fuel injection pump or fuel injector is damaged.	Repair or replace it

S/N	Cause	Troubleshooting
3	Others	
	(1) Intake valves and exhaust valves are leaked	Grind or readjust the valve clearance.
	(2) Cylinder leaked.	Check each cylinder gasket, and then tighten nuts on the cylinder head.
	(3) Valve spring is fractured.	Replace it
	(4) Piston rings leak	Replace the leaked piston ring
	(5) Piston is stuck with cylinder.	Remove and repair it.
	(6) There is water accumulated in cylinder.	Remove the cylinder head for dewatering, then find out the cause.
	(7) For air starter, timing of air distribution pan is wrong.	Remove for reinstallation.

6.2 The diesel engine can not output stipulated power

S/N	**Cause**	**Troubleshooting**
1	Operation	
	(1) Rotating speed is low.	Adjust to rated rpm.
	(2) The local altitude or ambient temperature is too high.	Refer to GB “Power Correction Table” for correcting the output power.
2	Fuel system	
	(1) Fuel injector failed (nozzle is clogged; atomization is poor; fuel injection pressure is not insufficient; the height of nozzle protruding from the cylinder head is not correct)	Refer to the specifications to adjust or repair the fuel injector.
	(2) Fuel injection pump unevenly pumps the fuel or some pump does not work.	Adjust the amount of fuel injection or repair the fuel injection pump.
	(3) Fuel injection pump wears, unable to pump enough fuel.	Properly screw out the limiting screw on adjusting rack in fuel injection pump; increase the mount of fuel injection or replace with the new piston assembly.
	(4) Diesel filter is clogged; the oil pressure in the fuel supply pump is insufficient, the check valve of fuel supply pump is fractured or worn; the spring is fractured.	Check, clean, adjust or replace it.
	(5) Diesel is not properly selected.	Refer to the local season (ambient temperature) for grade selection.
	(6) Advance angle of fuel injection is wrong.	Check and adjust it
3	Air distribution system	
	(1) Air cleaner, air compressor of supercharger and intercooler is not clean.	Dismantle and then clean them

S/N	Cause	Troubleshooting
	(2) The external exhaust pipe does not meet the requirements, and the back pressure of exhaust system is too high.	Refer to the specifications and design to arrange the exhaust pipeline.
	(3) Intake valves and exhaust valves are leaked	Check and grind them
	(4) Timing of inlet valves and outlet valves is wrong.	Check and adjust it
	(5) For the air starter, the inflation valve or starting valve on the cylinder head are leaked.	Dismantle and then grind them.
4	Others	
	(1) The compression pressure is insufficient (compression ratio is wrong or the piston rings are severely worn.)	Check, adjust or replace the piston.
	(2) Piston scuffs the cylinder liner, or other wear parts fail.	Remove the cylinder head to check inside surface of cylinder liner or other wear parts. If needed, timely repair or replace it.
	(3) Diesel engine can not sufficiently cool down and therefore overheats.	Check the belt tension, each part of cooling system, or remove the scale.
	(4) Each bearing overheats, caused by poor lubrication.	Repair or clean the lubricating system

6.3 Exhaust system smokes

S/N	Cause	Troubleshooting
1	Gray-white smoke	
	(1) Diesel engine temperature is very low.	Increase the coolant temperature at the inlet of engine.
	(2) Cylinder leaks water.	Remove the exhaust pipe or check the cylinder head.
	(3) Combustion in cylinder is not insufficient.	Check the compression pressure in the fuel injector or cylinder.
2	Gray-brown smoke	
	(1) Diesel engine is loaded severely	The load on the engine should drop.
	(2) Some fuel injection pump pumps too much fuel.	Refer to the chapter IV for adjustment.
	(3) Fuel injector fails (for example, if fuel drips at the nozzle, exhaust system will intermittently smoke)	Check the fuel injector or replace the nozzle.
	(4) The advance angle of fuel injection is insufficient (black smoke or flame comes from the exhaust system.)	Adjust the advance angle of fuel injection
3	Blue smoke	
	(1) With engine still at low temperature, oil blows into the combustion chamber.	Increase the coolant temperature at the inlet of engine.
	(2) The vehicle is new.	Prolong the running-in time
	(3). Piston rings wear	Repair

6.4 Abnormal noise or vibration during diesel engine running

S/N	Cause	Troubleshooting
1	Premature fuel injection or uneven fuel injection causes the clear, rhythmic and metallic knocking noise, especially at start or low speed.	Adjust the fuel supply advance angle or adjust the uniformity of oil amount.
2	The clearance between the intake valve and exhaust valve is excessive, making rhythmic and slight knocking noise.	Adjust valve clearance
3	Increase the load on diesel engine before being preheated. The clearance between the piston and cylinder liner is excessive, making knocking noise.	Unload diesel engine for idling and accordingly warming of diesel engine.
4	The wear of piston, piston ring and cylinder liner is excessive, making knocking noise.	Replace the related parts
5	Each journal severely rubs with bearing bush on crankshaft, making knocking noise along the overall length of diesel engine.	Repair or replace it
6	Compression ratio is too high, causing rough operation and large vibration.	The compression ratio should be adjusted to specification.
7	The clearance between the intake valve and exhaust valve is undersize, or the exhaust or intake timing is not correct, causing that the valve impacts the top of piston.	Adjust valve clearance or timing
8	Individual cylinder does not work and diesel engine vibration is aggravated.	Check the fuel system and solve the failure.
9	The valve is fractured (the valve lock clip is damaged, valve drops or the piston fractures, causing sudden or strong knocking noise)	Immediately stop vehicle for inspection.
10	Howling due to air leaks from the cylinder head liner	Check the cylinder head nuts for tightness or replace the cylinder liner.
11	Knocking noise due to the excessive wear of each gear	Check or replace it
12	The fixing bolts attaching to diesel engine is loose or damaged, causing vibration aggravating.	Tighten or replace the bolts
13	Diesel engine is not coaxial to the connected work device, aggravating the vibration.	Check and adjust it
14	Uneven foundation causes the deformation of common base plate.	Check and adjust it

6.5 Unstable operation of the engine

S/N	Cause	Troubleshooting
1	The flying iron in governor can not move smoothly, or its clearance widens.	Check for stuck phenomenon. Refer to the actual practice for repair or replacement
2	The buffer circlip in governor is lack of elasticity or fractured, making the adjusting rack shake or unsteady.	Check or replace it
3	Diesel engine rpm is too low; with engine idling at mid speed, two-purpose governor can not be automatically activated.	Increase to rated rpm.
4	The diesel engine load varies frequently.	Check the load output state.
5	Some cylinder intermittently fires, making the fuel be accumulated in cylinder and according leading to knocking of cylinder.	Check the fuel system.
6	The fuel injectors have different amount of fuel distribution and injection time.	Check and adjust it
7	Air enters the fuel system	Check or deaerate it.
8	Air enters the fuel system	Check the fuel system and deaerate it.
9	Timing gear plays forward/backward.	Check each gear for tightness.

6.6 Coolant pump can not absorb coolant or pump enough coolant

S/N	Cause	Troubleshooting
1	Air enters the coolant pump or suction pipe.	Fill them with water to drain the air.
2	Coolant pipe is clogged or freezed (cold season)	Clean or fill it with hot water or antifreeze.
3	Sealings of coolant pump are damaged or leaked.	Repair or replace it
4	Coolant pump belt is loosened.	Check and adjust it
5	Coolant pump has too much scale.	Remove the scale.
6	Coolant pump has too long suction.	Refer to the specifications to install the coolant pump.

6.7 Too low oil pressure

S/N	Cause	Troubleshooting
1	Oil quality is poor (because as the diesel engine is running, the oil pressure gradually drops)	Refer to the specifications to select the oil.
2	Diesel engine overheats or the oil is thinned.	Refer to the section VIII in this chapter.
3	Oil filter is clogged	Clean it.
4	Oil pipe joint is loosened or air enters oil pipeline.	Check and tighten it.
5	Diesel is mixed in the oil.	Find out the cause.
6	Pressure-regulating valve spring is fractured.	Replace it
7	Oil in the oil tank drop or the suction of oil pump is heightened.	Refill the oil, or reinstall the oil pump or oil tank.
8	The clearance between the connecting rod bearing and main bearing is widened.	Check or replace it

6.8 Diesel engine overheats

S/N	Cause	Troubleshooting
1	Coolant is insufficient.	Refer to the section VI in this chapter.
2	Coolant at the inlet is very hot.	Decrease the coolant inlet temperature.
3	Oil pressure is too low.	Refer to the section VII in this chapter.
4	Diesel engine is overloaded	Reduce load and find out the cause
5	Oil injection delays	Check and adjust it
6	Piston rings leak	Check or replace it
7	Each bearing match too tight.	Inspection and grind them
8	Ambient temperature is too high	Correct the power and reduce the load.

II. User Service Guide

Weichai Power Product Warranty Card (for user)

Name	Content	Name	Content
Model		Name	
Order No.		Zip code	
Number:		Address	
Purchasing date		Office phone	
Dealer		Home phone	

Respected users:

Thanks for using Weichai products!

In order to correctly use and maintain the diesel engine, please carefully read this manual and closely follow the specifications. In case of any failure, please timely contact with the Weichai Maintenance Center or Customer Service Center and we will delivery effective service on time.

"Service Registration Form" should be filled by the Maintenance Center during service and then saved by the user.

Weichai Power Co., Ltd.

Address: No.197 A, Fushou East Street, High-tech Industrial Development Zone, Weifang City, Shangdong Province

Zip code: 261205

Website: http://www.weichai.com

Engine sale phone: 0536-8197532

Spare-part sale phone: 0536-2297980

Service Hotline:

400 Free Service Hotline: 400-6183066

800 Free Hotline: 800-8603066

Customer Service Center: 0536-8235369 (Fax)

Customer Service Center Complaint: 0536-2297322

Service Registration Form (filled by the service staff)

Name	Content	Name	Content
Model		Name	
Order No.		Zip code	
Number:		Address	
Purchasing date		Office phone	
Dealer		Home phone	

Service Center Name	Date	Maintenance items	Replaced parts	Quantity	Signed by the service staff	Signed by user

Repairs instruction

1 “Domestic Repair”

Domestic users could call for 400 618 3066 or 800 860 3066 for repair.

Service Center 800 and 400 hotlines are available for 24h, providing quick and effective high-quality service. Oversea Center and Special Service Center are on duty for 24h wherever you are. Namely, where there are Weichai products, there is Weichai service.

2 “Oversea Repair”

User could call for Weichai Power Internal Service Hotline: 0536-8197520 or send a fax: 0536-8098063.

Diesel engine “Three-guaranty” warranty specification

I. "Three-guaranty” principle

1. Under the normal use and maintenance, Weichai Power will repair or maintain the damaged parts caused by its quality during “Three-guaranty” period for free.

2. The failed engine is mostly repaired. The related parts can be replaced.

3. Replacement of entire engine should meet the related specifications.

II. Industrial engine “Three-guaranty” warranty

1. From the date of purchasing the engine on the invoice, "Three-guaranty” lasts for 18 months or 1500h, whichever happens first. The parts possessing agreement with supporting factory should be warranted according to its agreement.

2. "Three-guaranty” warranty for the retail products: from the purchasing date on the invoice, the “Three-guaranty” will last for one year or 1500h, whichever happens first.

3. If the engine after being delivered is stored for one year or more, before starting it, notify the Industry Power Sale Company who will arrange the Weichai Special Service Center for paid maintenance. Otherwise, “Three-guaranty” warranty will be abandoned.

Industrial diesel engine “Three-guaranty” warranty specification

<table>
<tr><td colspan="3">Diesel Engine purpose</td><td colspan="3">Three-guaranty</td></tr>
<tr><td colspan="3">Diesel engines used for generating electricity, pump or air compressor</td><td colspan="3">18 months, or 1500h, whichever comes first</td></tr>
<tr><td colspan="6">The following parts are the basis ones; any part with manufacturing defects will be warranted for 24 months from the delivery date.</td></tr>
<tr><td>1</td><td>Engine block</td><td>2</td><td>Crankshaft</td><td>3</td><td>Connecting rod</td></tr>
<tr><td>4</td><td>Camshaft</td><td>5</td><td>Crankcase</td><td>6</td><td>Timing gear chamber</td></tr>
<tr><td>7</td><td>Cylinder head</td><td>8</td><td>Flywheel</td><td></td><td>Flywheel housing</td></tr>
<tr><td colspan="6">The following parts, as essential parts, have the warranty of 18 months, or 1500h, whichever happens first.</td></tr>
<tr><td>1</td><td>High-pressure fuel pump</td><td>2</td><td>Cylinder head</td><td>3</td><td>Cylinder liner</td></tr>
</table>

4	Oil cooler	5	Seawater – and -fresh-water heat exchanger	6	Oil pump
7	Piston	8	Seawater pump	9	Fresh-water pump
10	Piston ring	11	Intake pipe and exhaust pipe	12	Thruster
13	Piston pin	14	Rear oil seal of crankshaft	15	Metallic pipe joint
16	Bearing shell, connecting rod	17	Piston pin circlip	18	Oil-gas separator
19	Main bearing bushing	20	Front/rear mountings of engine	21	Radiator with fan
22	Camshaft bushing	23	Pulley- crankshaft	24	High-pressure fuel pipe
25	Valve	26	Metallic coolant pipe	27	Fuel anti-leak warning device
28	Valve spring	29	Intermediate gear shaft	30	Rotor, oil pump
31	Valve spring seat	32	Fuel injector (excluding nozzle)	33	Gear ring of flywheel
34	Valve opening	35	High-pressure fuel pump support	36	Bolts on connecting rod
37	Connecting pipe, valve	38	Coupler, fuel pump	39	Oil filter seat
40	Valve cover	41	All kinds of gaskets and covers	42	Air cleaner (without element)
43	Tappet	44	Metallic fuel pipe	45	Diesel filter (without element)
46	Push rod	47	Muffler	48	Oil filter (without element)
49	valve rocker	50	Silicon-oil shock absorber	51	Oil filter (without element)
52	Rocker seat	53	Fan support	54	Dipstick assembly
55	Rocker shaft	56	Hand pump	57	Nozzle
58	Oil sump	59	All kinds of gears	60	All kinds of bearings
61	Intercooler	62	Starting valve	63	Oil pressure-limiting valve
64	Air bottle assembly	65	Air bottle and valve	66	Pulley coupler
67	Electric control unit	68	Common-rail pipe	69	Cover in front of gear

	ECU				chamber
70	upper/down cover	71	Cover of oil radiator	72	Distribution pan
The following parts, as common parts, have the warranty of 12 months, or 750h, whichever comes first.					
1	Air starter	2	Tensioner	3	Front oil seal of crankshaft
4	Pressure-reducing valve of air starter	5	Oil seals of oil pump	6	Fuel return pipe of fuel injection pump
7	Fuel atomizer, air starter	8	Fuel supply pump	9	Gaskets of intake pipe and exhaust pipe
10	Hand pump	11	Gaskets of supercharger	12	Expansion valve
13	Dipstick	14	Fan	15	Bushing of fuel injector
16	Thermostat	17	Gaskets of oil sump	18	Bowl-type plug
19	All kinds of O-rings	20	All kinds of mechanical instruments	21	All kinds of bolts and crews
22	All kinds of weaved hose	23	Motor	24	Control panel
The following parts, as electrical parts, have the warranty of 12 months, or 750h, whichever comes first.					
1	Starter	2	All kinds of sensors	3	Electrical pre-supply pump
4	Generator	5	All kinds of instruments	6	Solenoid valve
7	Engine harness	8	Monitor assembly	9	Cutoff-solenoid valve
10	Relay	11	Battery	12	
The following parts, as wear parts, have the 7 months or 50h from the delivery date, whichever comes first.					
1	Belt	2	Plunger assembly in high-pressure fuel pump	3	Fuel injection nozzle assembly
4	Clamp	5	All kinds of spin-on elements	6	
7		8		9	

Note: The “Three-guaranty” of timers should be calculated referring to 10h each day.

Industrial power gas engine “Three-guaranty” warranty specifications

Engine purpose			Three-guaranty		
Gas engine for power generation			18 months or 1500h from the date of delivery, whichever comes first.		
“Three-guaranty” of gas engine parts is the same to that of diesel engine with same purpose.					
The following parts, as essential parts, have the 18 months or 1500h from the delivery date, whichever comes first.					
1	Electronic throttle	2	Exhaust control valve	3	Ignition module
4	Fuel metering valve	5	Heat exchanger	6	Gas thermostat
7	Electric control unit ECU	8	Signal generator	9	Mixer assembly
10	Throttle pipe	11	Fuel injection pipe	12	Support
13	Connecting pipe	14	Intake elbow	15	Air pipe joint
16	Pad	17	Cover	18	All kinds of metallic fuel pipes
19	All kinds of metallic air pipes	20	All kinds of metallic pipe joints		
The following parts, as common parts, have the 12 months or 750h from the delivery date, whichever comes first.					
1	Evaporation adjuster (for LPG)	2	Stabilizer (for LNG)	3	Decompressor (for LNG)
4	Three-way catalyst	5	Electrical control box	6	Polyurethane fuel pipe
7	Rubber hose	8			
The following parts, as electrical parts, have the 12 months or 750h from the delivery date, whichever comes first.					
1	Solenoid valve	2	All kinds of sensors	3	Ignition coil
4	Relay	5	Harness	6	Ignition cable
The following parts, as wear parts, are out of “Three-guaranty”					
1	Spark plug	2	Fuel filter assembly		

Note: The “Three-guaranty” of timers should be calculated referring to 10h each day.

Weichai industrial engine spare parts "Three-guaranty" warranty specification

Weichai power promise to deliver spare part quality warranty and "Three-guaranty": Under the normal use and maintenance, Weichai Power will free repair or maintain the damaged parts caused by its quality during "Three-guaranty" period.

I. Spare part "Three Guaranty" specifications

Only if the failed parts belong to quality defect, and the date on the invoice or sale list printed by Weichai Spare Part System will prevail.

1. Low-value wear parts are not covered by "Three guaranty"

Gaskets: all except for cylinder head gaskets;

Filter elements: air cleaner, diesel filter, oil filter;

Rubber: waterproof ring of cylinder liner, sealing rubber ring, sealing gasket of oil pan;

Sensor: coolant temperature sensor, oil pressure sensor;

Assembly: fuel injection nozzle, high-pressure fuel pump piston;

Fasteners: clamp and clip;

Bolts: connecting rod, cylinder head, main bearing etc.

2. The wear parts and electrical parts have 3months of warranty

The following parts belong to wear parts and electrical parts					
1	Starter	2	Belt	3	Preheating device
4	Generator	5	Electronic throttle pedal	6	A/C condenser
7	Dewatering filter (without element)	8	Engine harness	9	Fuel-saving switch
10	Thermostat	11	Clamp	12	Monitor assembly
13	Solenoid valve	14	Power pre-supply pump	15	Relay
16	Battery	17	Piston ring	18	Piston
19	Cylinder liner				

3. The essential and common parts have 6 months of warranty

The following parts belong to essential and common parts					
1	Cylinder head	2	Gear shaft	3	Crankshaft balancer
4	Lifting device for idling	5	Gear ring	6	Rear oil seal of crankshaft.
7	Supercharger	8	Oil pump	9	Metallic fuel pipe
10	Fan	11	Intake pipe and exhaust pipe	12	Metallic coolant pipe
13	Piston pin	14	Oil sump	15	Metallic pipe joint
16	Bearing shell, connecting rod	17	Front/rear mountings of engine	18	SCR box
19	Main bearing bushing	20	Pulley	21	Oil-gas separator
22	Camshaft bushing	23	Flange	24	ECU
25	Fuel supply pump	26	Telematics	27	Common-rail pipe
28	Valve	29	High-pressure fuel pump	30	High-pressure fuel pipe
31	Valve spring	32	Fuel injector body	33	Cooling nozzle
34	Valve spring seat	35	Shock absorber	36	Dipstick assembly
37	Valve port	38	Strainer	39	Fuel filter body
40	Valve guide	41	Air compressor	42	Oil filter seat
43	Valve cover housing	44	All kinds of gaskets and covers	45	Flywheel
46	Tappet	47	Cylinder gasket	48	Thruster
49	Push rod	50	Coolant pump	51	Pressure-limiting valve
52	valve rocker	53	Oil radiator	54	Dipstick
55	Rocker seat	56	Fan support	57	Piston pin circlip
58	Rocker shaft	59	Silicon-oil fan clutch	60	Electromagnetic fan clutch
61	WEVB system	62	Gear	63	Tensioner

64	Steering pump	65	Bushing of fuel injector	66	Bowl-type plug
67	Front oil seal of crankshaft	68	Other kinds of oil seals	69	All kinds of rubber hoses
70	Fuel return pipe of fuel injection pump	71	Hand pump	72	Fuel supply pump

4. The basis parts have the 12 months of guaranty

In case of any failure within “Three-guaranty”, Oversea Center manager should take the picture of it at site and determine the work-hour cost.

The following parts are basis ones					
1	Cylinder block	2	Connecting rod	3	Flywheel housing
4	Crankshaft	5	Camshaft	6	Timing gear chamber
7	Cylinder head	8			

5. Any issue caused by assembling quality will not be covered by the “Three-guaranty”.

II. The following items are not covered by “Three-guarantee”

1. The engine failures caused by the improper operation, maintenance and matching, failures caused by user’ transportation, exceeding the operational range of manual, mismatching, overloading, overspeeding, improper running-in and maintenance, or use of inferior oil, antifreeze and "Three-filter”.

2. Failures caused by modifying, adjusting or removing any parts unallowable in instruction.

3. Oil, filter element, hose, belt and fuel injector assembly which is normally used, consumed or maintained.

4. Lack of Warranty Card, invoice or other documents demonstrating that the products are still within “Three-guaranty”.

5. The product model and type on the “Three-guaranty” Certificate or invoice are not consistent to that needed to be guaranteed, or the “Three-guaranty” Certificate or invoice is modified.

6. The damaged state is not maintained, making the failure cause unable to

be technically determined.

7. Failures caused by misoperation.
8. Damaged by force majeure, such as war or natural disaster etc
9. Engine is damaged by the traffic accidents.
10. Products are used for other purpose without our company permission.