



Model LJ465Q-1ANE1 Petrol Engine
Instruction Book

Guangxi Liuzhou Wuling Motors Co., Ltd Liuzhou Machine Plant

Respectfully notify users

Thank you for choosing Model LJ465Q-1ANE1 electronic fuel injection type (DELPHI system) front drive petrol engine produced by our plant. Model LJ465Q-1ANE1 petrol engine (including petrol engine, clutch and transmission), a new type petrol engine which meets the requirements of environmental protection, is jointly developed by our plant and DELPHI

company, is characterized by compact structure, strong rising power, low oil consumption, high speed and low noise etc. Also, because the petrol engine adopts advanced petrol engine management system (abbreviated to electronic fuel injection or EMS), it works normally under every operating condition, therefore, mini buses fitted with the electronic fuel injection type petrol engines produced by our plant have comfortable driving, optimum economic and perfect environmental protection performance.

This instruction book briefly demonstrates main technical performance, technical data and service & maintenance of Model LJ465Q-1ANE1 petrol engine. **Please read this manual carefully and observe the regulations strictly before you use the petrol engine** so that your vehicle is often kept under an optimum condition to play greater efficiency and achieve better economic benefits. **When you read this instruction book, if you find some different or mutual contradictions for the same maintenance methods about the engine provided in other materials, please perform maintenance according to this instruction book.**

To continuously improve performance and quality of the petrol engine and serve vast

customers, if you find problems or have improvement opinions during operation of the petrol engine produced by our plant, kindly let us know by correspondence even if you are engaged, we will thank you very much.

Model LJ465Q-1ANE1 petrol engine is an ideal engine of mini buses; purchasing Model LJ465Q-1ANE1 petrol engine as minibus engine is your optimum choice.

Guangxi Liuzhou Wuling Motors Co., Ltd Liuzhou Machine Plant

Descriptions of Symbols

“” : Indicates driver and passenger ’s personnel safety, please pay special attention to and follow it as required.

“” : Indicates the safety and maintenance of the engine, please follow it as required.

“” : Indicates simplifying and facilitating maintenance.

Contents

- Chapter 1 Technical Characteristics and Specifications of the Petrol Engine
 - Section 1 Technical Characteristics and Specifications of the Petrol Engine
 - Section 2 External Characteristics Curve of the Petrol Engine

- Chapter 2 Application of the Petrol Engine
 - Section 1 Brief Introduction
 - Section 2 Notices to Application of the Petrol Engine
 - Section 3 Running-in of the Petrol Engine

- Chapter 3 Maintenance of the Petrol Engine
 - Section 1 Maintenance of the Lubrication System
 - Section 2 Maintenance of the Cooling System
 - Section 3 Maintenance of the Generator Belt
 - Section 4 Maintenance of the Petrol Filter
 - Section 5 Maintenance of the Distribution Mechanism and Synchronous Chain
 - Section 6 Maintenance of the Spark Plug
 - Section 7 Assembly of Dual-coil Ignition System
 - Section 8 Maintenance of Forced Ventilation Valve (PCV Valve) of the Crankcase

Chapter 4 Periodic Inspection of the Petrol Engine

- Section 1 Service Intervals and Maintenance Content of the Petrol Engine
- Section 2 Torque of Main Bolts of the Petrol Engine
- Section 3 Torque of Main Bolts of the Transmission
- Section 4 Torque of Main Bolts of the Clutch

Chapter 5 Main Troubles and Troubleshooting of the Petrol Engine

- Section 1 Difficult Starting of the Petrol Engine
- Section 2 Sufficient Power in Running
- Section 3 Knocking Sound inside the Petrol Engine
- Section 4 Overheating of the Petrol Engine
- Section 5 Excessive Engine Oil Consumption
- Section 6 Difficult Gearshift of the Transmission
- Section 7 Noise inside the Clutch

Chapter 6 Sealing-up and Unsealing of the Petrol Engine

- Section 1 Safekeeping of the Petrol Engine
- Section 2 Unsealing of the Petrol Engine

Chapter 1 Technical Characteristics and Specifications of the Petrol Engine

Model	LJ465Q-1ANE1
Type	Four-cylinder, four stroke, water cooling, inline, multiple spherical combustion chamber, overlapping camshaft, electronic fuel injection and electronic control ignition
Cylinder diameter	65.5 mm
Piston stroke	78 mm
Compression ratio	8.8:1
Displacement	1.1 L
Rated power	38.5 kW
Maximum torque	83 N · m/(3000 rpm ~3500 rpm)
Minimum fuel consumption	275g/ kW · h
Rated revolution	5200 rpm
Idle speed	(900±30) rpm
Idle discharge	GB14761-99 $C_o \leq 3.5\%$
Rotation	Clockwise (viewed from the front side of the engine)
Work order	1-3-4-2
Engine oil pressure	0.924Mpa~0.490Mpa (3000rpm)
Overall dimensions	(L×W×H) 451×550×647 mm
Net quality	95 kgs excluding the transmission

Fuel grade		Over than No. 90 unleaded gasoline (GB17930-1999)		
Oil grade		SP 15W/40 or API SG SAE15W40 gasoline engine oil is used at above -20℃ of ambient temperature; SP 15W/30 or API SG SAE15W30 gasoline engine oil is used at above -20℃ of ambient temperature		
Engine oil amount		2.7L (newly fitted engine oil filter)	2.5 L (old engine oil filter)	
Coolant		Ethanediol water solution or soft water		
Clutch	Type	Single, membrane spring		
	Overall dimensions	(Pressure plate housing): $\Phi 271 \times 33.6$ mm		
	Weight	2.7 kgs		
Transmission	Every gear ratio	Four-gear transmission		Five-gear transmission
		1st gear	3.818	3.818
		2nd gear	2.210	2.210
		3rd gear	1.423	1.423
		4th gear	0.906	1.033
	5th gear		0.844	
Transmission	Every gear ratio	Reverse gear: 3.583		
	Main reduction ration	4.444		

	Type	Gear engagement, synchronizer, four forward gear, one reverse gear	Gear engagement, synchronizer, five forward gear, one reverse gear
	Overall dimensions	(L×W×H) 306×394.5×440 mm ³	(L×W×H) 342.7×394.5×440 mm ³
	Weight	23 kgs	25 kgs
	Lubrication	85W/90 GL-4 or GL-5 gear oil GB 13895-92 or fix the brand in special areas according to the application environment and temperature	
	Amount of lubrication	2.1 L	

Note: The idle discharge standard of the petrol engine is national mandatory regulations and will be continuously amended. Model LJ465Q-1ANE1 petrol engine will continuously meet the requirements of the latest national standard.

Chapter 2 Application of the Petrol Engine

1. Multiple-point fuel injection system

This system is multiple-point sequential fuel injection system, four oil injectors of four cylinders inject oil in the order of 1-3-4-2. Every injector injects oil once for every two crankshaft revolutions of the petrol engine.

2. Idle speed

The petrol engine should run at idle speed for several minutes to warm up after being started.



The idle discharge index of the engine produced by the plant at ex-factory is strictly controlled within the requirements of the national standard, idle speed of model LJ465Q-1ANE1 petrol engine is 900 ± 30 r/min. The idle mechanism of the petrol engine is reset at ex-factory, customers should change it arbitrarily

Keep the engine at hot state while checking discharge, that is above 80°C of water temperature & above 60°C of engine oil temperature (at 900 ± 30 r/min of idle speed) . Idle and discharge index are changed any time, make periodical detection and adjustment for every test point during the application of the engine.

Trouble Code List

Trouble Code	Trouble Descriptions
P0105	Too high intake manifold pressure
P0105	Too low intake manifold pressure
P0110	Too low intake manifold temperature
P0110	Too high intake manifold temperature
P0115	Too low coolant temperature (circuit open or shorted to battery)
P0115	Too low coolant temperature (circuit shorted to earth)
P0120	Too high throttle-valve position (circuit open or shorted to battery)
P0120	Too low throttle-valve position (circuit shorted to earth)
P0130	No signal from the oxygen sensor
P0170	Excessive rich period of the oxygen sensor
Trouble Code	Descriptions
P0170	Excessive thin period of the oxygen sensor
P0201	Circuit malfunction of injector A (cylinder 1)
P0202	Circuit malfunction of injector B (cylinder 3)
P0203	Circuit malfunction of injector C (cylinder 4)
P0204	Circuit malfunction of injector D (cylinder 2)
P0230	Fuel pump relay circuit shorted to battery
P0230	Fuel pump relay circuit open or shorted to earth

P0335	No signal from 58X crankshaft sensor
P0335	Signal malfunction of 58X crankshaft sensor
P0351	Coil 1-4 circuit shorted to battery
P0351	Coil 1-4 circuit open or shorted to earth
P0352	Coil 2-3 circuit shorted to battery
P0352	Coil 2-3 circuit open or shorted to earth
P0443	Carbon canister solenoid valve circuit shorted to battery
P0443	Carbon canister solenoid valve circuit open or shorted to earth
P0480	Fan 1 circuit shorted to battery
P0480	Fan 1 circuit open or shorted to earth
Trouble Code	Trouble Descriptions
P0481	Fan 2 circuit open or shorted to battery
P0481	Fan 2 circuit open or shorted to earth
P0500	No signal from the speed sensor
P0505	Idle control malfunction
P0560	Excessive battery voltage
P0650	Failure indicator circuit shorted to battery
P0650	Failure indicator circuit open or shorted to earth
P1530	Air conditioner relay circuit shorted to battery
P1530	Air conditioner relay circuit open or shorted to earth
P1604	EEPROM memory malfunction
P1605	FLASH memory malfunction

P1610	Burglar-proof controller malfunction
P1610	Communication error between ECU and burglar alarm
P2000	Too high temperature of the front evaporimeter
P2000	Too low temperature of the front evaporimeter
P2001	Too high temperature of the rear evaporimeter
P2001	Too low temperature of the rear evaporimeter
Trouble Code	Trouble Descriptions
P2100	Rear circulation cut-off valve of air conditioner circuit shorted to battery
P2100	Rear circulation cut-off valve of air conditioner circuit open or shorted to earth

Section 3 Running-in of the Petrol Engine

The service life of the petrol engine is mainly dependent on the earlier use. New petrol engine should be run-in in the vehicle for 2500 kilometers according to the running-in standard

or for 30 hours according to the running-in standard on the test-bed.

The following should be done to run-in the petrol engine in the vehicle:

1. Check

Check engine oil, coolant, gasoline, battery electrolyte for sufficiency, replenish and repair if insufficient amount and leakage.

2. Road surface

Vehicles should run on the cement or asphalt road surface, do not attempt to run on other road surfaces, especially on sand & mud roads.

3. Running-in standard

The petrol engine should be run-in on the vehicle, follow the running-in standard of the petrol engine shown the following table, it is not allowed to be higher than every gear speed shown in the following table. If there exists between the vehicle running-in standard and this standard, this standard should be followed.

Running-in Standard of New Petrol Engine Fitted in the Vehicle

Transmission gear	Vehicle Speed
1st gear	10 km/h
2nd gear	20 km/h
3rd gear	35 km/h
4th gear	55 km/h
5th gear	65 km/h

4. Load

During running-in, the vehicle load is not allowed to exceed 50 % of rated load in the first 1000 kilometers and 75 % of rated load in the next 1500 kilometers.

5. Maintenance

The petrol engine should be maintained according to the specified items shown in the following table after running-in new vehicle for 2500 kilometers.

Maintenance Items after Running-in New Petrol Engine

No.	Items	Maintenance contents		
1	Generator belt	Check wear and adjust tension		
2	Synchronous chain tensioner	Check flexibility and adjust tension		
3	Throttle valve clearance	Check, adjusting if necessary	Cold	0.13mm~0.18mm
			Warm	0.23mm~0.28mm
4	Cylinder head bolt and fixed nuts of intake & exhaust manifold	Tighten according to the specified torque		

5	Engine oil filter	Replace
6	Engine oil of the petrol engine	Replace
7	Transmission gear oil	Replace
8	Spark plug clearance	Check and adjust to the specified value
9	Idle speed and discharge	Check idle and discharge value and adjust according to regulations

Chapter 3 Maintenance of the Petrol Engine

Section 1 Maintenance of the Lubrication System

1. Oil used for the petrol engine

When ambient temperature is over than -20°C , SF15W/40 gasoline engine oil (or API SG SAE15W40 gasoline engine oil) is used;

When ambient temperature is lower than -20°C , SF5W/30 gasoline engine oil (GB11121-1995) or API SG SAE5W30 gasoline engine oil is used.



Replace engine oil after running-in new petrol engine for 2500 kilometers and run smoothly every 5000 kilometers.

2. Engine oil level of the petrol engine

Engine oil amount inside the engine oil tray is measured with a dipstick on the right side of

the petrol engine. Perform measurement after the petrol engine stops running for about 5 minutes, draw out the dipstick, wipe out engine oil with a piece of clean cloth, then insert engine oil tray again and measure engine oil level.

Check engine oil level before running, engine oil level should be kept between the upper limit and lower limit of the engine oil dipstick, if oil level is near or lower than the lower limit, replenish engine oil to the upper limit.

3. Replace engine oil of the petrol engine

Change engine oil of the petrol engine on the asphalt road surface once every 5000 kilometers, often check it on the severe sand and mud, change in time according to the oil quality, but it's not allowed to exceed once every 5000 kilometer.

When changing engine oil of the petrol engine, warm up the petrol engine for 10 minutes, open the oil cap after stopping the vehicle, and tighten the discharge plug of the engine oil tray of the petrol engine, drain out engine oil and tighten the oil plug. Replenish about 3 liters of new engine oil from oil cap, and close the oil cap.

Start the petrol engine and run for 5 minutes, check for oil leakage, then stop the vehicle, check oil level after stopping the vehicle and wait for 5 minutes, replenish engine oil to upper

limit of the engine oil dipstick if insufficient.



When tightening the oil discharge plug, please make sure not to be burnt by engine oil.

4. Engine oil used for the transmission

85W/90 GL-4 or GL-5 grade gear oil, GB13895-92 or No. 18 dual-curve gear oil.



Proper lubrication oil of the petrol engine and the transmission is an important factor to ensure good work and service life, customers should pay special attention to the oil choice, do not mix engine oil with the different production areas, brand and standard so as to prevent the different oil variety to cause chemical change and affect proper work of the petrol engine.

It's not allowed to use engine oil brand which is not specified, in particular never use imported engine oil.

5. Replacement of engine oil of the transmission

Change gear oil of the transmission once every 40000 kilometers (excluding running-in period).

When changing gear oil of the transmission, warm up the petrol engine for about 10 minutes, screw out the oil plug and oil discharge plug on the extension power-brake behind the transmission after stopping the vehicle, empty out engine oil inside the transmission, screw in the oil discharge plug, replenish gear oil from the oil plug hole till the oil is overflowed.



Never replenish gear oil from the mounting hole of the back-up light switch.

6. Cleaning of lubrication system

If there are excessive foreign matters deposited in the engine oil tray, clean the lubrication system of the petrol engine with light spindle oil.



Never clean with gasoline or gas oil.

When cleaning exterior parts of the petrol engine, replenish 3 liters of light spindle oil inside the petrol engine from the oil hole, start the petrol engine with the engine and race for 2~3 times once every 1 minute, then quickly drain out the spindle oil used for cleaning, and replenish the petrol engine with engine oil as required again.

After changing new engine oil every time, run the petrol engine at the no load condition for 3~5 minutes so as to ensure sufficient engine oil is available in the lubrication system and its oil supply parts.

7. Replacement of engine oil filter

Replace one engine oil filter once every 10000 kilometers. The fixed torque is $12\sim 16\text{ N}\cdot\text{m}$ ($1.2\sim 1.6\text{kgf}\cdot\text{m}$) .

8. Check engine oil pressure indication system

Under normal case, when turning the power switch (key) to “ON”, the engine oil pressure

indicator comes on, showing no engine oil pressure; turn the switch to “START”, the petrol engine is started at idle speed, at that time, the engine oil pressure indicator automatically goes off, showing normal engine oil pressure. If the engine oil pressure indicator doesn’t go off, showing the engine oil pressure in the petrol engine lubrication system is abnormal, first check engine oil amount of the petrol engine is sufficient.

Turning the switch to “ON”, the engine oil pressure indicator goes off, but the engine oil pressure switch is connected to the bonding iron of the body at idle, the engine oil pressure switch cuts off the bonding iron of the body, showing the engine oil pressure switch works normally. At that time, check the indicator and related circuit have malfunction.

Section 2 Maintenance of the Cooling System

The cooling system is one of essential conditions to guarantee normal work of the petrol engine, therefore, it’s necessary to guarantee sufficient coolant inside the petrol engine, perform inspection before running the vehicle every time, replenish in time if insufficient.

1. Coolant

Model LJ465Q-1ANE1 petrol engine is allowed to use distilled water or properly treated soft water and antifreeze as coolant, the freezing point of antifreeze is 5°C lower than the lowest temperature of used areas.

During the winter seasons, when using water as coolant, a warm warehouse must be provided to keep warm so as to avoid frozen coolant, or drain out the cooling water of the radiator and the petrol engine in time after stopping the vehicle to avoid frost crack of the radiator and the petrol engine. For the petrol engine without a discharge plug in the cylinder, do not use water as coolant in winter.



Water volume can be expanded after frozen, which seals the radiator, water pump, cylinder head, the cylinder body will be burst open.

2. Replenishing coolant

Replenish the coolant according to the following steps::

- (1) Screw out the radiator cap and replenish coolant, fill the radiator with coolant till the

storage water barrel level reaches “FULL” graduation. Note: do not allow to exceed “FULL” graduation.

(2) Close and tighten the radiator cap.

(3) Start the petrol engine, run it at idle speed for 2~3 minutes, screw out the radiator cap, as there are some air in the discharge waterway, the coolant level is reduced, at that time, replenish the coolant till “FULL” graduation.

3. Replenish coolant

After long time use, when coolant level in the storage water barrel is lower than “LOW” graduation, replenish the coolant according to the following steps:

If the coolant is reduced greatly in a short time, the cooling system could be leaked, it should be checked carefully.

4. Replace coolant

After long time use, when replacement of the coolant is needed because the coolant is deteriorated or do some repair, the following steps should be followed:

(1) Screw out the radiator cap, open the water discharge valve at the bottom of the radiator and drain out coolant.

(2) Remove the storage water barrel and drain out coolant.

- (3) Screw out the water discharge plug on the crankcase and drain out coolant.
- (4) Fix the discharge plug of the storage water barrel, radiator, and discharge valve and crankcase as usual, fill the coolant according to the filling steps.



When replace coolant, the vehicle should be kept on a level place.

5. Never remove and not fit the thermostat assembly



Not fitting the thermostat assembly will prolong the warm-up time after starting the petrol engine, the petrol engine working at low temperature for a long time will result in rapid wear of the machine parts and affect the service life.

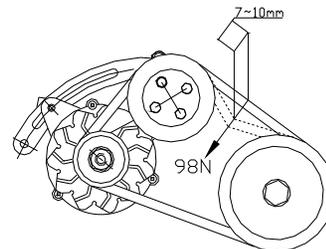
Section 3 Maintenance of the Generator Belt

The generator belt is used to drive the generator, water pump and the pulley of crankshaft, often check and maintain the generator belt.



Sufficient tension or damaged generator belt could result in excessive heat of the petrol engine and reducing generated energy.

1. Adjustment



When the petrol engine is stopped, release two fixed screws in the lower part of the generator and adjusting screws in the upper part of the generator, push the generator outwards till the generator belt reaches the required tension shown in Section 2 of this chapter.

2. Tension measurement

As shown in the left drawing, 98 N • m (10 kgs) is applied to the generator belt between the water pump and crankshaft pulley, drafts of new generator belt is about 7~10 mm, and that of old one is 10~15 mm.

3. Appearance

Appearance of the generator should be in good order, replace in time if it's poor to affect service.

Section 4 Maintenance of the Petrol Filter

Replace gasoline filter in time so as not to affect oil supply or result in injector clogging.



For the petrol engine with the electric injection system, do not use gasoline filter of the petrol engine with a common carburetor.

Section 5 Maintenance of the Distribution Mechanism and Synchronous Chain

The distribution mechanism and synchronous chain should be often checked and maintained, once the broken synchronous chain will result in collision between the throttle valve and the piston so as to result in damage of the throttle valve, piston, rocker and camshaft. Therefore, besides running-in period of the vehicle, check once every 20000 kilometers and adjust or replace properly if necessary.



Even if you are expert, we recommend that you should send the maintenance items to the auto plant or technical service station or our technical service center

1. Check and Adjustment of Timing Sprocket

Open the sprocket chamber cover, check the mounting mark position of driving and driven

sprockets is correct, if it's not correct or timing is not doubted correct, perform inspection according to the following regulations:

remove the spark plug, move the flywheel in accordance with the engine working direction, observe the mark on the flywheel through the hole on the transmission, to ensure the key on the front end of the crankshaft align with the arrow inside the belt cover. Check the piston of the number one cylinder(near the radiator) at the up dead line of compression situation, i.e. has gap at the intake, exhaust valve and adjust screw of the rocker arm. If it is not correct, turn the crankshaft 360°again, the mark on the driven synchronization gear (align with

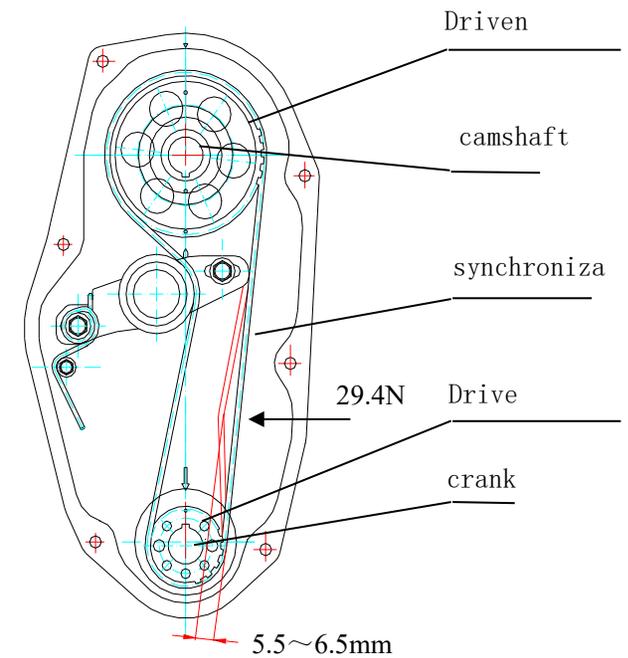


Fig. 7 maintenance

the key) will align with the arrow on the inner cover of the belt, if has different, adjust it, and check the tension of the belt according the requirement show on fig.7.

Rotate the crankshaft 360°to ensure the number one cylinder at the top dead line at exhaust situation ,the number four cylinder at top dead line at compression situation, one of the two marks on the synchronization belt must align with mark (△) on the belt cover, (fig.7) .

Check the synchronization belt according to situation mentioned on table, remove it if any was found, replace it in case of serious situation. Normally, it should be replaced every 100000KM. Drive synchronization gear

Table —4 **checking of the belt**

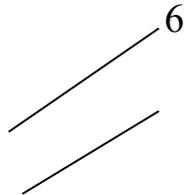
序号	Fault situation
1	Adhesive belt cirrhosis on the back. The back was polished, without elasticity, harden. Without mark left when press with nail.
2	Cracked on the back.

序号	Fault situation
3	Cracked mark or layer on the cloth.
4	Worn teeth (initial stage). Cloth worn at loaded side, side worn.
5	Worn teeth (anaphase). Cloth worn out at loaded side, rubber exposed (thin teeth).
6	Cracked teeth base.
7	Teeth lost.
8	Side worn. Worn at the whole side circle.
9	Side cracked.

Section 6 Maintenance of the Spark Plug

Replace the spark plug after the vehicle runs every 10000 kilometers, always check and replace if damaged, when replacing, pay attention to model F6RTC and screw $M14 \times 1.25$.

The insulator surface of the center electrode of the spark plug and exterior electrode should be kept clean, carbon deposit is not allowed, remove with fine sand paper if carbon deposit existed.



Clearance of the spark plug is 1~1.2 mm, which is even and same on the overall center electrode.

Section 7 Assembly of Dual-coil Ignition System

The electronic ignition system of model LJ465Q-1ANE1 petrol engine is “dual-coil” ignition system. The electronic ignition system can greatly improve control accuracy of ignition time, work reliability, ignition energy and ignition voltage.

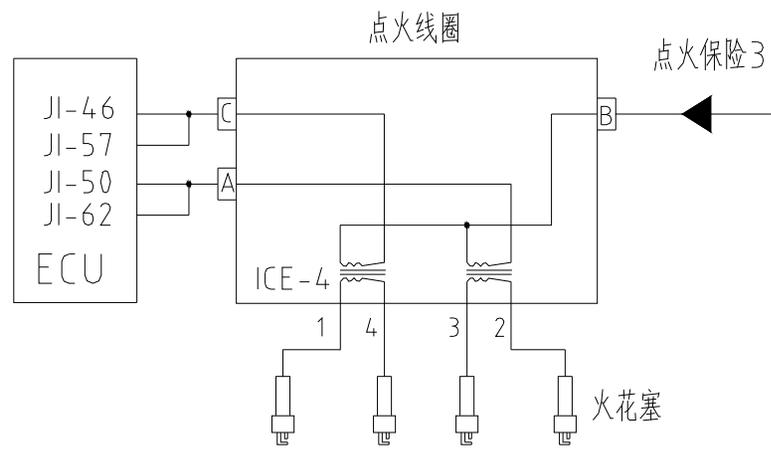
1. Composition

The system is composed of power source, ignition, electronic controller, ignition coil, high pressure damping coil and spark plug etc.

2. Wiring

Ignition coil

Ignition fuse 3



Spark plug

Dual-coil ignition system

Section 8 Maintenance of Forced Ventilation Valve (PCV Valve) of the Crankcase

PCV valve is composed of valve body, valve, valve cap and spring, which is decomposable. Its main function is to guide the waste gas in the crankcase into intake manifold through PCV valve and be burnt finally so as to avoid environmental pollution of waste gas in the crankcase, remove it once every 10000 kilometers, wash and clean oil as well as dry it, then push its valve with steel wire and to see if it is flexible. Replace with new valve if the valve is seized up or not ventilated.

Chapter 4 Periodic Inspection the Petrol Engine

Section 1 Service Intervals and Maintenance Content of the Petrol Engine

odometer or month, subject to the earlier one.		Months	2	6	12	18	24	30	36	42	48
5	Engine oil filter		R	R	R	R	R	R	R	R	R
6	Gasoline engine oil	Change once every 5000 kilometers									
7	Fuel rubber pipe and connector (aging pipe, cracked or damaged connector)		I	I	I	I	I	I	I	I	I
8	Rubber pipe and connector of cooling system of the petrol engine (water leakage and damage etc)		-	-	I	-	-	I	-	-	I
9*	High pressure damping coil (deteriorated and damaged)		-	-	I	-	-	I	-	-	I
10*	Spark plug		-	R	R	R	R	R	R	R	R
The service period should		kilometers × 1000	2.5	10	20	30	40	50	60	70	80

be judged according to the odometer or month, subject to the earlier one.		Months	2	6	12	18	24	30	36	42	48
11	Gasoline pump (check for oil leakage)	-	-	I	-	I	-	I	-	I	
12	Air filter	Clean once every 10000 kilometers for asphalt road. Clean once every 2500 kilometers for dust road.									
13	Accelerator control pull wire and throttle valve shaft	-	I L								
14*	Idle and idle discharge	A	A	A	A	A	A	A	A	A	
15	PCV valve	-	I	I	I	I	I	I	I	I	
17*	Clutch clearance	-	I	I	I	I	I	I	I	I	
18	Transmission gear oil (check for oil leakage under a level condition)	R	I	I	I	R	I	I	I	R	

Notes: the meaning of the symbols in the table:

“A”——Check or adjust “L”——Lubricate “R”——Replace
“I”——Make visual check and adjust or replace if necessary
“T”——Check with special torque spanner



Even if you are expert, we recommend that you should send the maintenance items marked with “*” to the auto plant or technical service station and special repair center of our plant.

Section 2 Torque of Main Bolts of the Petrol Engine

No.	Name	Torque (N • m)
1	Cylinder head connecting bolt	55~60
2	Intake & outlet manifold nutS	18~23
3	Spark plug	20~28
4	Mounting bolt of camshaft timing sprocket	55~60
5	Adjusting nut of throttle valve	18~20
6	Mounting bolt of crankshaft timing sprocket	55~60
7	Connecting rod bearing cap nut	28~32
8	Crankshaft head bolt	43~48
9	Flywheel bolt	40~45
10	Engine oil tray bolt	4~5

11	Oil discharge plug	30~35
12	Cylinder head bolt	4~5
13	Sprocket chamber cap bolt	9~12
14	Oil pressure sensor	12~15
15	Engine oil filter pipe nipple	20~25
16	Fixed bolt of rear suspension bracket	18~23
17	Safety valve spring base of engine oil pump	15~20
18	Fixed bolt of the petrol engine suspension (left & right)	18~23
19	Bolt & nut of suspension cushion	35~40
20	Tensioner mounting bolt	18~23

Section 3 Torque of Main Bolts of the Transmission

No.	Name	Torque (N • m)
1	Connecting bolt of transmission housing	15~20
2	Oil filling and oil discharge plug	32~38
3	Connecting bolt of extension power-brake housing	15~20
4	Shift shaft housing screw (8 mm)	9~12
5	Shift shaft housing screw (6 mm)	6~10
6	Thrust screw of shift fork shaft	15~20
7	Connecting bolt between transmission and cylinder body	32~38

Section 4 Torque of Main Bolts of the Clutch

No.	Name	Torque (N • m)
1	Clutch pressure plate screw	25~29

Chapter 5 Main Troubles and Troubleshooting of the Petrol Engine

Section 1 Difficult Starting of the Petrol Engine

Trouble Phenomenon and Cause		Troubleshooting
a. The engine is not rotated	1. Loose connection of battery electrode or insufficient power	Tighten or charge
	2. Open circuit	Check and repair
	3. Damaged engine	Repair or replace
b. The spark plug is not lighted	1. Poor earthing	Repair
	2. Damaged ignition coil	Replace
	3. Improper spark plug clearance or burnt	Adjust or replace

c. Oil supply system malfunction	1. Insufficient oil of gasoline pump	Repair or replace
	2. Gasoline hose and gasoline filter plug	Clean
d. Reduced cylinder compressed pressure	1. Broken cylinder gasket	Replace
	2. Improper adjustment of throttle valve clearance or damaged	Adjust, repair or replace
	3. Worn piston, piston ring and cylinder	Repair or replace

Section 2 Sufficient Power in Running

No.	Trouble Phenomenon and Cause	Troubleshooting
1	Improper adjustment of accelerator pedal and throttle valve	Adjust
2	Reduced cylinder compressed pressure	1. Check throttle valve, spark plug, cylinder gasket for leakage. 2. Grind cylinder
3	Insufficient gasoline supply	Adjust or repair
4	Insufficient intake air	Check intake system
5	Air exhaust clogging	Check exhaust system and remove carbon deposit
6	Improper spark plug clearance or damaged	Adjust or replace

Section 3 Knocking Sound inside the Petrol Engine

No.	Trouble Phenomenon and Cause	Troubleshooting
1	Worn bush, camshaft cam and rocker	Replace
2	Severe wear of camshaft, connecting rod neck and piston pin	Replace or repair
3	Damaged piston ring	Replace
4	Improper throttle valve clearance	Adjust
5	Excessive thrust clearance of the camshaft	Adjust

Section 4 Overheating of the Petrol Engine

No.	Trouble Phenomenon and Cause	Troubleshooting
1	Improper spark plug clearance or carbon deposit	Clean or adjust
2	Loose intake manifold, clogged exhaust pipe	Tighten or clean
3	Insufficient tension of generator belt	Adjust
4	Insufficient coolant or clogged water pipe	Replenish or clean
5	Improper clearance of water pump or damaged	Repair or replace
6	Insufficient engine oil	Replenish
7	Oil line clogging or damaged engine oil pump	Clean or replace
8	Damaged cylinder gasket	Replace
9	Slipped clutch	Repair or replace
10	Radiator clogged by scale	Clean or replace

Section 5 Excessive Engine Oil Consumption

No.	Trouble Phenomenon and Cause	Troubleshooting
1	Worn or damaged throttle valve oil seal	Replace
2	Worn or damaged oil ring	Replace
3	Piston ring is not staggered as required	Adjust
4	Damaged cylinder gasket	Replace
5	Worn throttle valve and throttle valve conduit	Replace
6	Excessive heat of the petrol engine, inner pressure increase, some lubrication oil exhausted along with ventilating hole.	Check related parts and remove

Section 6 Difficult Gearshift of the Transmission

No.	Trouble Phenomenon and Cause	Troubleshooting
1	Worn synchronous gear	Replace
No.	Trouble Phenomenon and Cause	Troubleshooting
2	Worn synchronous gear	Replace
3	Damaged fixed ball	Replace
4	Deformed shift fork or uneven wear	Repair or replace

Section 7 Noise inside the Clutch

No.	Trouble Phenomenon and Cause	Troubleshooting
1	Worn or damaged release bearing	Replace
2	Worn front output shaft bearing	Replace
3	Loose clutch hub	Repair
4	Cracked clutch pressure plate	Replace
5	Loose pressure plate and diaphragm spring	Repair or replace
6	Oil immersed in clutch friction lining	Clean or replace
7	Broken damping spring of the clutch	Replace

Chapter 6 Sealing-up and Unsealing of the Petrol Engine

Section 1 Safekeeping of the Petrol Engine

1. Empty out all coolant in the radiator, cylinder body and water pump.
2. Wipe out the surface with cleaning gasoline.
3. When the petrol engine is warm, the piston is between the upper and lower limit, screw out the spark plug of every cylinder, fill about 10~15g of No. 217 antirust oil into the cylinder, and run for 3-5 circles, then screw in the spark plug and cover the exhaust pipe as specified torque.
4. Pack or seal the throttle valve intake, intake & outlet of the petrol engine and tachometer bushing with paraffin paper.
5. Place the petrol engine inside the packing case.

Section 2 Unsealing of the Petrol Engine

1. Remove exterior grease of the petrol engine.
2. Screw out the spark plug, race the petrol engine, empty out the antirust inside the cylinder as much as possible.
3. Replenish engine oil.
4. Replenish coolant.
5. Unseal every sealing hole.