J4 Service Manual

Introduction

The manual is to help service technicians authorized by JAC MOTORS to provide effective and proper maintenance and repairing for J4 Series cars. The passionate service and proper operation of JAC MOTORS professional service technicians is vital to assure the high user satisfaction, for this reason, the service technicians must get fully knowledgement about this manual. This manual should be placed in easy-to-reach place, so that it can be used for reference at any time.

All the contents including pictures, technical parameters within this manual are the latest, and JAC MOTORS will provide technical information or additional volume when the maintenance is affected due to products improvements. For this reason, please pay close attention for any relevant information on the latest developments while using the manual. JAC MOTORS reserves the right to make design changes, additions or improvements for JAC products.

Without the authorization of JAC MOTORS, it's forbidden to copy or modify this manual in any form, including, but not limited to, electronic, paper, audio-visual, mechanical, and other methods.

The use of non-genuine spare parts or unqualified fuel during the maintenance and repairing for JAC products may cause damage to the products.

General Content

Engine Register

Engine Mechanical

Engine Body

General precautions:

1、Precautions for drain engine coolant:

Drain engine coolant after the engine is cooled down.

2、Precautions for disconnecting the fuel line

1) Before the start of work, please confirm that within the work area, there is no easily burning or sparks-producing objects.

2) Before disconnection and disintegration, please release the pressure of the fuel.

3) Plug the openings after disconnecting the pipelines, in order to prevent fuel leakage

3、 Precautions for disassembly and disintegration

1) When it requires using the special maintenance tools, please use them as required. Always pay attention to the safe operation, and must follow the instructions.

2) Caution! Do not damage the mating surface or sliding surface

3) If necessary, use adhesive tape or the equivalents, to seal the openings of engine system, for fear of the entry of foreign bodies.

4) Identify and put the disassembled components and parts in order, for ease of troubleshooting and reassembly.

5) Loosen the bolt and nut is based on the principle that to release the outermost, and then release the diagonal locations, and so on. If having specified a release order, please operate in the specific order.

4、Precautions for Inspection, Repair, and Replace the parts

Inspect the components and the parts thoroughly before repairing or replacing them. First of all, inspect the newly replaced components and parts as stated above, if necessary, replace it.

5、Precautions for assembly and installation

1) Using a torque wrench to tighten nuts and bolts.

2) The principle of tighten the bolts and nuts is to tighten the center ones in the same tightness by multi-steps, and then tighten those on inside and outside the diagonal lines. If having specified the tighten order, please operate in the specific order.

3) Replace with a new gasket, oil seal or "O" ring.

4) Thoroughly rinse, clean and dry each part and component. Carefully check the pipelines of engine oil and engine coolant without blocking.

5) Be sure not to damage the sliding surface or the mating surface. Thoroughly clean the dust and dirt, or other foreign bodies. Smooth the sliding surface with engine oil before assembly.

6) After exhaust the engine coolant, when re-filling it, please release the air in the pipe firstly.

7) After repair, start the engine and raise the engine in order to check the engine coolant, fuel, engine oil or the tail-gas whether leak or not.

6、The components and parts needed to be tightened in the settled angle.

1) Use the angle wrench to tighten the following components and parts on the engine finally.

- Cylinder Head Bolt
- Main Bearing Cap Bolt
- Connecting Rod Cap Bolt

2) Do not do the final tightening according to the torque value.

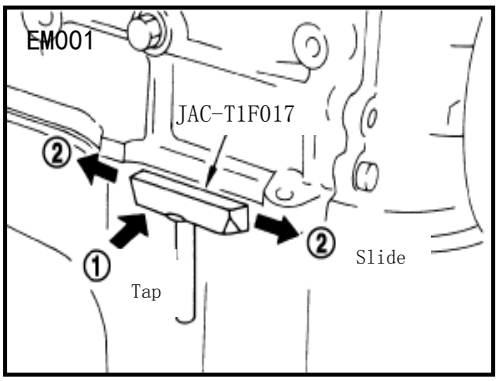
3) The torque value of the components and parts applicable to the pre-tightening procedures.

4) Make sure the threads surface and the base surface clean, and then daub the engine oil.

Precautions for Sealant:

1、Refer to “Removal of the sealant”， in page EM-2.

After disassembling the fixed nuts and bolts, use the scraper to separate the mating surface, and disassemble the used sealant.



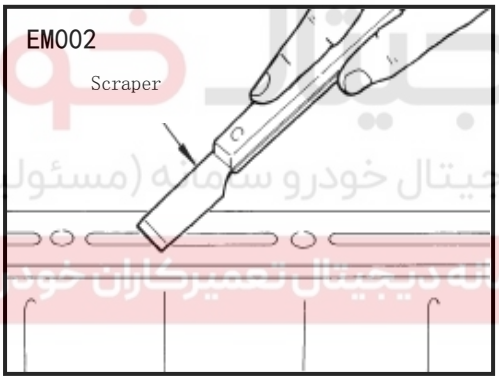
Caution:

Be careful not to damage the mating surfaces.

Insert the scraper, and then knock as shown in the figure

Slide it sideways.

In those areas where the seal cutter is hard to use, please use a plastic hammer to lightly tap the parts and to disassemble it.



If for some unavoidable reasons, tools such as a flat screwdriver have to be used,

Please be careful not to damage the mating surfaces.

2、The application procedure of the sealant

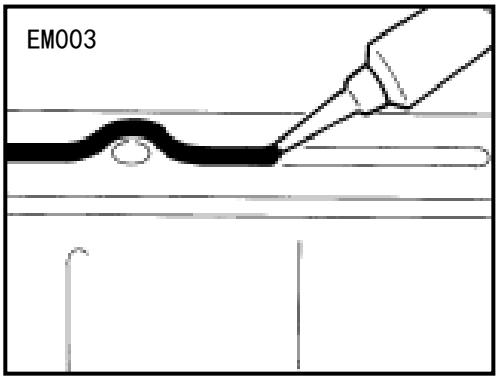
1) Use the scraper to remove the used sealant adhering to the application surface of the gasket and the used sealant adhering to the mating surface of the gasket

Caution:

Clear up the used sealant from the grooves on the application surface of it, from the set bolts, as well as from the bolt holes.

2) use of unleaded gasoline to clean the application surface and the mating surface of the sealant, clear the adhering water,lubricating grease, and foreign bodies.

3) Put the sealant with specified dimension fully in the specified location



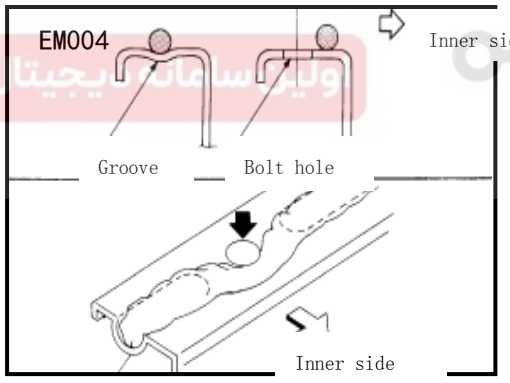
If there is a groove to put the sealant, please put it into the groove.

As for bolt holes, normally put sealant inside them， and occasionally outside them.

Install the binding elements within 5 minutes after gluing the sealant

Components:

If the sealant has stains, please clean them off immediately.



Please do not re-tighten bolts or nuts after the installation.

After 30 minutes of the installation, please fill the engine oil and engine coolant.

Engine Coolant

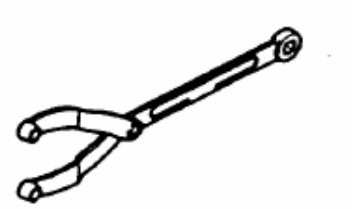
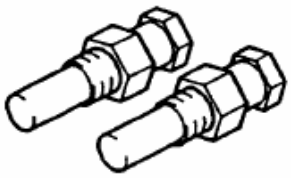
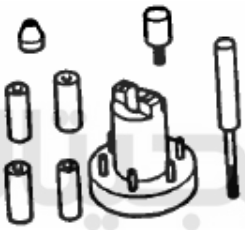
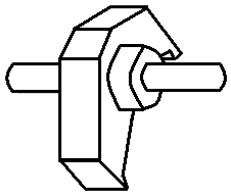
Caution:

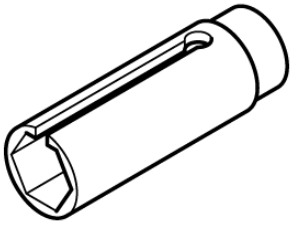
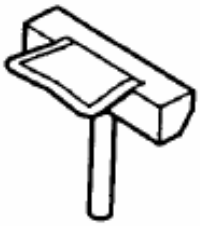
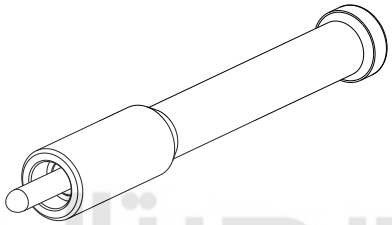
-- If there are special instructions in this manual, please follow the instructions.

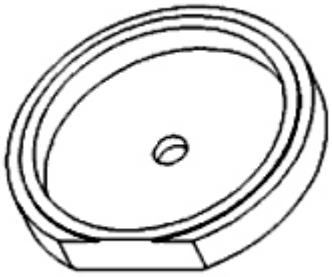
Preparations

1、Service tools:

List of Special Tools

SN	Tool	Outline drawing	Serial Number	Description:
1	The fork clamp		JAC-T1D001	The timing gear of the fixed camshaft
2	Pin			Use cooperatively with fork clamp
3	Positioning tools of piston pin		JAC-T1F005	Install and disassemble piston pin
4	Guide Bush			Use cooperatively with positioning tools of piston pin,as well as setting tool
5	Flywheel stop dog		JAC-T1F011	Fixed flywheel
6	Valve spring compressor.		JAC-T1F012	Compressed valve springs

7	Oxygen sensor sleeve		JAC-T1F015	5)Disassemble and install oxygen sensor
8	Oil pan and removal tools		JAC-T1F017	Disassemble the oil pan
9	The installer of valve oil seal		JAC-T3F001	Install valve oil seal
10	The oil seal installer of camshaft		JAC-T3F002	Install oil seal of engine camshaft
11	Front Oil Seal guide of Crankshaft		JAC-T3F003	It plays a guiding role when installing the front oil seal of camshaft
12	Front oil seal installer of Crankshaft		JAC-T3F004	Install front oil seal of engine crankshaft

13	Rear oil seal installer of Crankshaft		JAC-T3F005	Install rear oil seal of Crankshaft

2、Engine assembly auxiliary materials table

SN	Name	Using position	Specifications and Grades
1	Engine oil	Oil filling, assemble with the engine oil	5 W - 30 (NORTHERN WINTER)15 W - 40 (northern summer and full year the south) Quality rating is on SJ level or above
2	Silicone	The oil pump, water pump, oil pan, crankshaft and rear oil seal shell	LT 5699 or equivalent products
3	Sealant:	Oil pressure switch, drain screw plug, flywheel bolt	LT 243 or equivalent products
4	Sealant:	Coolant temperature sensor and Water temperature warning switch	LT648 or equivalent products
5	Petrol		RON #93 and lead-free petrol above RON #93
6	Sealant:	Stud bolt	LT271 or equivalent products

3、Cylinder assembly auxiliary materials table

Cylinder assembly auxiliary materials table

SN	Name	The materials used and model	Assembly Location
1	Engine oil	5 W - 30 (NORTHERN WINTER)15 W - 40 (northern summer and full year the south) Quality rating is on SJ level or above	Valve Head, camshaft, oil seal of camshaft
2	Sealant:	LT271 or equivalent products	Stud bolt
3	Sealant:	LT962T or equivalent products	Spark plug guide bush, cylinder block/cylinder head Bowl-type plug tablet, and filler neck

Engine Assembly

1、Precautions for disassembly and installation:

Warning:

Please operate as the following requirements; otherwise, it may result in personal injury!

Park the car on a flat, solid ground.

Caution:

Always pay attention to the safe operation, and must follow the instructions.

Before the exhaust system and the engine coolant completely cool down, you must not start work.

If the engine chapter does not contain the required items or work, please refer to the relevant chapters.

Always use the dedicated support point for lifting, and choose the proper car lifting machine according to the circumstances.

2、Preparation work for disassembling the engine and the transmission assembly

1) Summary

First of all, disassemble the engine and transmission assembly from the car, and separate the engine and the transmission.

2) Preparation

① Release the fuel pressure please refer to "Release the fuel pressure"

② Drain engine coolant from radiator

Please refer to “Changing engine coolant”.

③ Drain the engine oil, transmission oil, and clutch oil. Please refer to "Engine oil" and "Transmission oil" and "clutch circuit".

④ Recycle the refrigerant in the refrigerant lines.

⑤ Drain power steering fluid ， please refer to "power steering fluid":

Caution:

Do not perform this step until engine cools down.

Please do not spill engine coolant on drive belts.

⑥ Disassemble the following parts:

The engine trims cover. Please refer to "the intake manifold".

The Engine Hood Assembly， Please refer to the "Engine Hood".

The front wheels and tires. Please refer to the "Wheels and tires".

The engine deflector (left and right)

The air-duct and the air cleaner assembly

Please refer to the air-duct.

The battery, the battery holder, battery holder bracket Please refer to "Battery".

The radiator assembly and radiator fan. Please refer to the "radiator".

3、Disassembly of the related component in the engine compartment

① disconnect the following pipe lines and move aside

Caution:

When you disconnect them, use the plug to prevent leakage.

The fuel inlet line of the injector Please refer to the “Fuel Injectors”.

Vacuum hose of vacuum booster on the engine side please refer to the "vacuum booster".

The PCV hose please refer to "Fuel evaporation control system".

Inlet connectors of the clutch please refer to the "clutch hydraulic lines".

High-voltage and low-voltage tubes on the Air Conditioning Compressor Please refer to "A/C compressor".

② Disassemble steering fluid reservoir.

③ Disassemble the wire drawing of the selecting shifts. Please refer to "the operation mechanism of the selecting shifts".

④ Disconnect the the following wiring harness and connect the plug-in components, as well as the wire harness retainer, and remove.

Oxygen sensor

Engine coolant temperature sensor

Crankshaft position sensor:

Camshaft position sensor:

Vehicle speed sensor

The VVT Oil Control Valve wiring harness

Throttle valve position sensor:

The Air Inlet Absolute Pressure Sensor

Ignition coil

Fuel injector

Knock sensor

The generator

The starter motor

A/C switch

4、Disassembly of related element on Automobile Chassis

① Disassemble the front drive shaft. Please refer to the front drive shaft.

② Disassemble the forepart of the exhaust pipe please refer to the "exhaust system".

③ Disassemble the engine support beam. Please refer to the "Engine support beam".

5、Disassembly work

① Hang the lifting hook on the lifting ear of the Engine

② Raise the engine and fix it in place.

③ Use the manual lift table or equivalent tools to firmly support the engine and the bottom of the transmission assembly and at the same time adjust the lift tensity.

Caution:

Put the pads at the support surface, and to ensure it in a steady state.

④ Separate the left and right, front and rear suspension of the engine. Please refer to the "Engine Suspension".

⑤ Lower the engine and the transmission assembly. When carrying out the work, please read the following precautions:

To confirm that they do not interfere with vehicles

To make sure that all connections have been disconnected

To remember the vehicle's center of gravity will change, and if necessary, please use the jack to support rear lifting point to avoid falling off.

6、Separation work

① The engine and transmission assembly, the air conditioning compressor assembly.

② Disassemble the starter motor.

③ Use the lifting jack to raise, and separate the engine and the transmission.

Caution:

Always confirm that there is no wiring harness before lifting and during the process of lifting.

7、Installation

Please read the following precautions and install them in the reverse order of disassembly.

1) Do not damage the engine suspension bolsters. Avoid engine oil spilling over the cushions.

2) Confirm that all engine suspension are properly fixed, and then tighten the nuts and bolts.

8 Inspection after installation:

1) Check for leaks.

The following is to check the fluid leaks step, oil leaks step and exhaust leaks step.

Before starting the engine, please check engine coolant and engine oil level. If it is less than the required amount, please fill till the assigned position.

Use the following steps to check for fuel leaks.

- turning the ignition switch to the "ON" position, check for the fuel leak in the connections.

Start engine, and check for fuel leaks at connections again when the engine speeds up.

Run the engine to check for abnormal noise and vibration.

To warm-up then engine thorough, confirm that there is no fuel, exhaust or any fluid leaks (including the engine coolant and engine oil leak).

Bleeding or fill from the corresponding line pipes and hoses.

After the engine cools down, please re-check the oil level (including the engine oil and engine coolant). If necessary, re-fill to the assigned level.

2) Check the project overview

Check for leaking item list

Project	Before starting the engine	Engine running	After the engine is shut off
Engine coolant:	Fluid Level	Leakage	Fluid Level
Engine Oil	Fluid Level	Leakage	Fluid Level
Transmission Oil, brake fluid, power steering fluid, Clutch Fluid	Fluid Level	Leakage	Fluid Level
Fuel	Leakage	Leakage	Leakage
Exhaust	-	Leakage	-

Engine belts

1、Check the drive belt:

Warning:

To make sure that performing operations after the engine has been shut off.

1) Check the belt for aging, cracks, wear and traces of oil. If necessary, replace it.

2、Tensity adjustment

Tensity adjustment table

Position	Adjustment Method
Alternator belt.	Adjust the adjusting bolt on the generator.

Caution:

Please do not allow the engine oil and engine coolant to spill on the belt.

-- Do not excessively twist or bend belt.

3、The disassembly of generator's belt

1) Loosen the generator's adjustment nut and its support nut. Use the adjusting screw to adjust tensity.

2) Tighten the generator's adjustment nut and its support nut.

Tighten the torque: generator adjustment nut: 22.5 ±2.5 N ·M

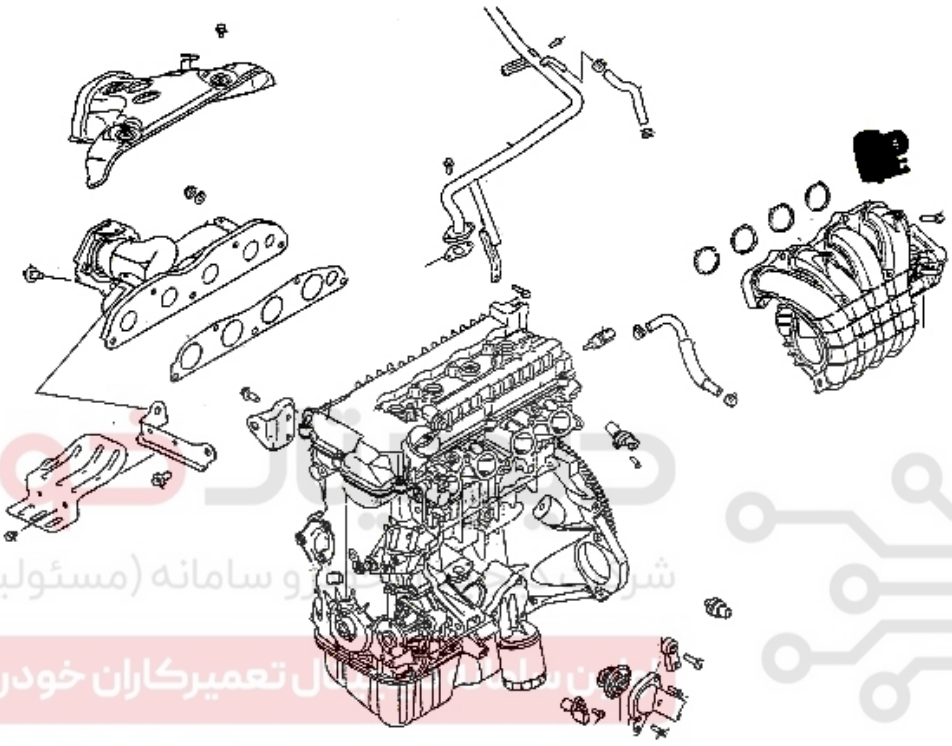
generator support nut: 47 ±5 N ·m

4、The Installation of generator's belt

1) Install the belt on the pulley according to the reverse order of removal.

2) Verify that the belt tensity is in the standard range (450 - 550 N M).

The intake manifold and exhaust manifold



The intake manifold and exhaust manifold breakdown drawing.

1、The intake manifold

1) Disassembly

Warning:

Please do not drain the engine coolant when the engine warms up, in order to avoid burns.

① Drain engine coolant: Please refer to “Changing engine coolant”.

② Release the fuel pressure， please refer to "Release the fuel lines pressure"

③ Disassemble the engine trim cover.

Tighten the torque: 8 to 12 N M.

④ Disassemble the air cleaner assembly. Please refer to the "air cleaner assembly".

⑤ Disconnect the the following wiring harness and connect the plug-in components:

The Air Inlet Absolute Pressure Sensor

Fuel injector

Electronic throttle valve position sensor:

Carbon canister control solenoid valve

⑥ Disconnect the following hose connections.

The water pipe fittings (please install the plug to prevent engine coolant leaking)

The PCV tube

Vacuum hose of vacuum booster on the engine side

Vacuum hoses in the carbon canister solenoid valve side.

Small loop pipes in the throttle body

⑦ Disassemble throttle body mounting screw and throttle body, remove throttle body assembly.

⑧ Disassemble the injector assembly. Please refer to the “Fuel Injectors”.

Tighten the torque: 18.4 ±1.4 N M.

⑨ Disassemble the intake manifold and the bracket of the engine block.

Tighten the torque: 10 ±20 N M.

⑩ Disassemble the intake manifold mounting bolts and nuts.

Tighten the torque: 18 ±1.0 N M.

⑪ Remove the intake manifold and the intake manifold's gasket.

2）Inspection after Disassembly:

Check the air intake manifold for cracks or any other damages and for whether the matching surface is deformed or not. Please repair or replace as necessary.

3）Installation

According to the reverse order of removal

Caution:

-- Do not re-use the components and parts that are no longer available.

Before starting the engine, please check engine coolant level. If it is less than the required amount, please fill till the assigned position.

Use the following steps to check for fuel leaks.

- turning the ignition switch to the "ON" position, check for the fuel leak in the connections.

Start engine, and check for fuel leaks at connections again when the engine speeds up.

To warm-up then engine thorough, confirm that there is no fuel, or the engine coolant leak.

After the engine cools down, re-check the engine coolant level. If necessary, re-fill to the assigned level.

2, Exhaust manifold

1) Disassembly

Warning:

After the exhaust system cools down thoroughly, perform this operation.

① disconnect the oxygen sensor harness connector; if necessary, use a special tool to remove the Oxygen Sensor.

Tighten the torque: 40 ±60 N M.

Caution:

-- Do not damage Oxygen Sensor.

-- Drops to hard ground from any place higher than 0.5 m , the oxygen sensor will be not able to use, please replace it.

②Disassemble the mounting bolts of the exhaust manifold insulation mat and remove exhaust manifold insulation mat.

Tighten the torque: 5 ±10 N M.

③ disconnect the connection between three-way catalytic converters and exhaust manifold.

Tighten the torque: 38 ±52 N M.

④ disassemble the exhaust manifold bracket cap screws and remove exhaust manifold bracket.

■ Tighten the torque: 20 ±1.0 N M.

⑤ disassemble the mounting bolts of the exhaust manifold and remove exhaust manifold.

Tighten the torque: M8 35 ±2 N M.

2）Inspection after Disassembly:

Check to see whether the exhaust manifold mating surface is deformed or not.

3) Installation

Install them according to the reverse order of removal.

Caution:

-- Do not re-use the components and parts that are no longer available.

-- Please do not over-tighten Oxygen Sensor to avoid damaging Oxygen Sensor.

Timing chain wheel body

1、 Component description:

Timing belt diagram

2、 Disassembly and installation of timing chain:

1）Disassembly

a) Disassemble the fixed bolt of water pump pulley.

Tighten the torque: 7～ 8.2 N m.

Note:

Disassemble it relying on the drive belt friction when the drive belt has not yet been removed.

b) Disassemble the drive belt and check the drive belt for wearing, aging, and cracks, and if the above phenomenon exists, please replace the drive belt.

c) Disassemble oil dipstick components

Tighten the torque: 7～ 8.2 N m.

d) Disassemble vibration damper

Tighten the torque: 185 ±195 N M.

e) Disassemble generator

f) Disassemble the oil pan and cylinder head cover.

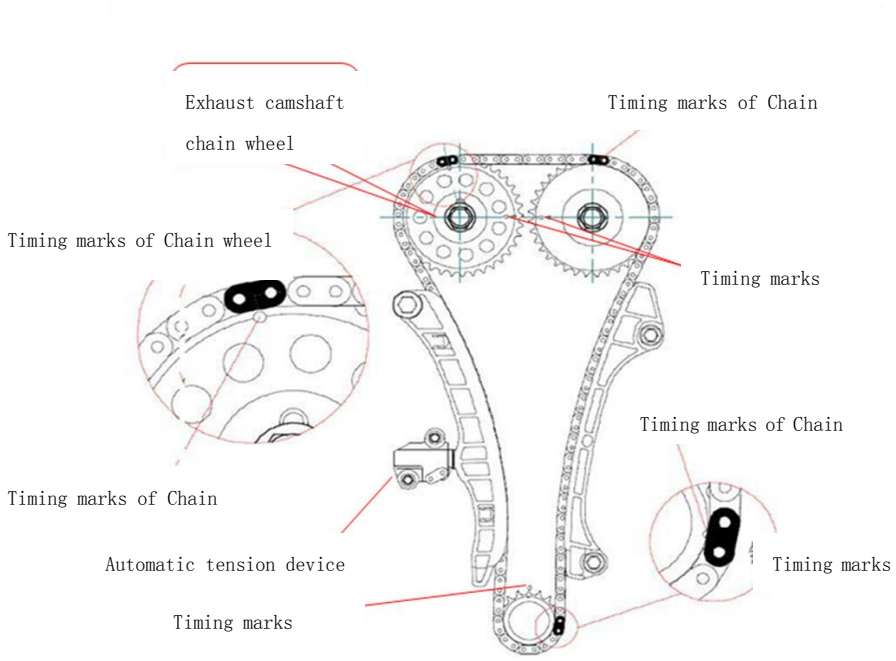
Caution:

First, disassemble the oil pan and cylinder head cover, and then disassemble the oil pump assembly.

g) Disassemble the pump assembly

h) Check the timing

Check whether the five timing points meet the requirement as shown in the figure.



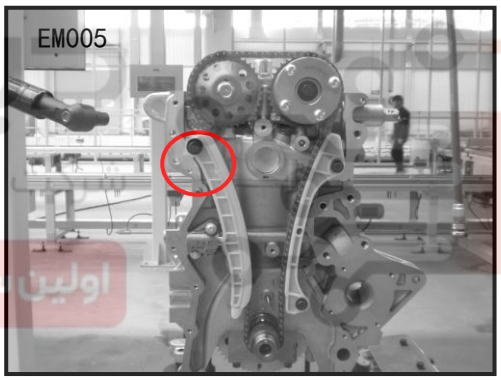
i) Disassemble automatic tensioner, as well as the orbit and the dynamic rail of the timing chain. And check to see if there is an exception.

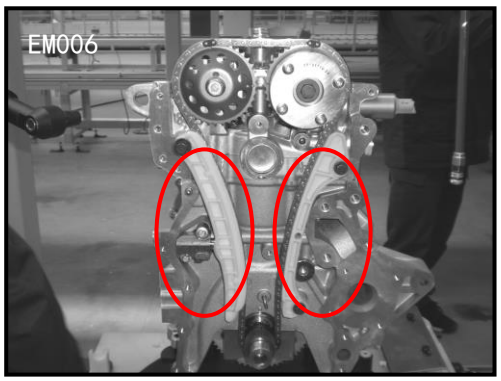
Tighten torque:

Automatic Tensioner: 9 ~ 11 N M.

Orbit: 10~12 N m

Dynamic rail: 19～28 N m





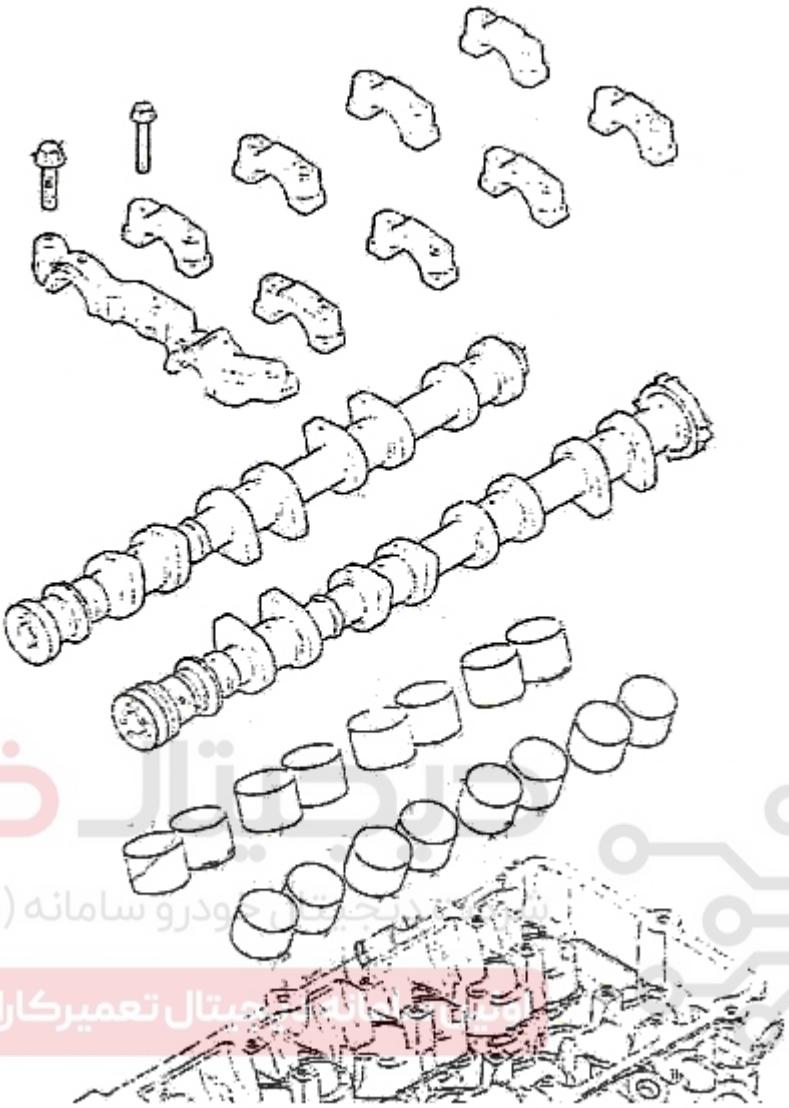
j) Disassemble exhaust Camshaft Sprocket bolt

Tighten the torque: 78～98 N m

k) Disassemble the intake cam timing controller

Tighten the torque: 64.5 ±5.5 N M.

2）



Installation

Install it according to the reverse steps of disassembly as stated above. During the installation process, pay much attention to the timing point and the torque installation.

Camshaft assembly

1、Component description:

Camshaft breakdown drawing

2、 Disassembly and installation:

1）Disassembly

① Disassemble the engine trim cover. Please refer to "the intake manifold".

② Disassemble high pressure ignition coil. Please refer to "Ignition coil".

③ Fixation of power steering pump's pressure line

④ Disconnect PCV hoses and camshaft position sensor harness connector.

⑤ Disassemble valve cover from the cylinder head

⑥ disassemble the valve cover gasket from the valve cover, and remove spark plug tube sealer from the spark plug tube.

⑦ Disassemble the timing chain wheel. Please refer to "Timing chain wheel body".

⑧ Disassemble the timing gear of the camshaft

a. Fix the camshaft with a wrench

b. Tighten the timing gear bolts of the camshaft

Tighten torque: 59～70N ·m

c. Remove the timing gear of the camshaft

⑨ Disassemble camshaft position sensor from the rear of the cylinder head end

Tighten the torque: 9～11 N ·m.

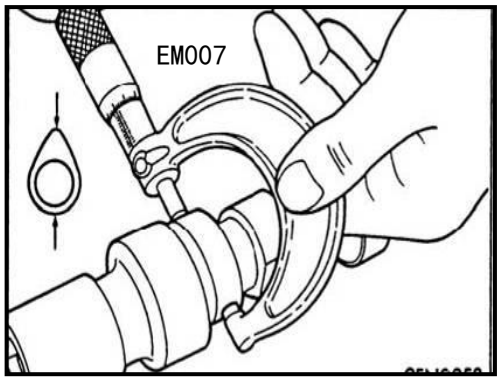
Caution:

To be careful to avoid clashing

10 Use the appropriate tools to disassemble the front oil seal of camshaft.

Caution:

Do not damage the matching surface between cylinder head and the camshaft.



⑪ Remove camshaft from the cylinder head

2) Inspection after disassembly

①camshaft

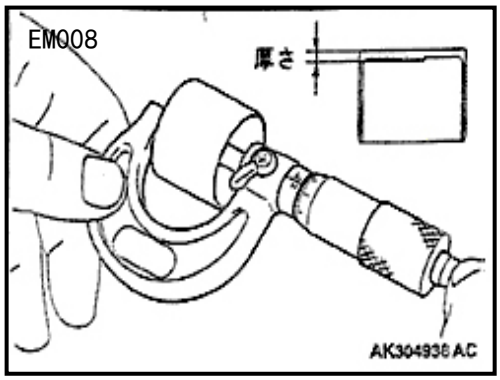
The measure of Camshaft cam's height

Intake: 44.7054 ±0.1mm

Exhaust: 44.2836 ±0.1mm

If the value does not meet the above standard value, please change the camshaft.

②Mechanical followers



The measurement of thickness of the mechanical followers

3) Installation

① Install mechanical followers

② Install the camshaft.

Caution:

Paint the engine oil on the camshaft journal and cam.

Pay attention to the installation direction of the camshaft.

③ Install camshaft position sensor:

Caution:

In the rear-end cover flange coated with a sealant.

Tighten the fixed bolt after the stand is fully seated.

④ Install the front oil seal of the camshaft.

⑤ Install the timing gear of camshaft

⑥ please read the following precautions and install them in the reverse order of disassembly based on this step.

Before installing the valve cover, please eliminate all the sealant on the cylinder head cover.

Verify that the valve cover gasket is in good condition, and has been put into the slot of the valve cover.

4) Inspection after installation:

Examine that all components are installed.

Before starting the engine, please check engine oil level. If it is less than the required amount, please fill till the assigned position.

Run the engine to check for abnormal noise and vibration.

After the thorough warm-up, confirm that there is no engine oil leak.

After the engine cools down, re-check the engine oil level. If necessary, re-fill to the assigned level.

3、Valve clearance

1) Inspection

When disassemble or replace the related parts and components of the camshaft or mechanical followers, or when the engine run abnormally due to the valve clearance's change, please do the following inspection.

① Disassemble valve cover please refer to the “camshaft".

② Measure valve clearance in accordance with the following steps

a. Fix compression stroke TDC (1-Cylinder). Rotate crank belt pulley clockwise, align the timing mark.

b. Use filler gauge valve to adjust the screw and stem head clearance

Valve clearance: intake valve 0.22 ±0.03 mm

Exhaust Valve 0.30 ±0.03 mm

c. Rotate crankshaft pulley for 1 ring

③If it exceeds the standard, please adjust. Please refer to the "Adjustments".

2) Adjust

① loosen the nut, loosen the adjusting screw.

② Insert filler gauge that has the equal magnitude with the valve clearance between the adjustment screws and stem head.

③ Fix the adjusting nut and slowly tighten the adjusting screw until twitch the filler gauge with a slight resistance, and then tighten the adjusting nut.

④ Verify again whether the valve clearance is in the standard range.

⑤ if not, repeat the steps 1 to 4 until valve clearance is in the standard value.

⑥ the manual rotation of crank, refer to the standard value to confirm cold valve clearance in the standard value.

⑦ Install them in reverse order of disassembly. Install all the parts and components that have been disassembled.

⑧ Engine warm-up, check to see if there is an abnormal noise and vibration.

Cylinder head cover

1、 the vehicle repair

1) Check the cylinder pressure.

① Warm-up thoroughly, and then shut down the engine.

② Release the fuel pressure please refer to "Release the fuel pressure"

③ Disconnect the fuel pump fuse to avoid fuel oil spray when measuring.

④ Use a special tool to disassemble ignition coil and spark plug. Please refer to "Ignition coil"and "spark plug".

⑤ Disassemble the engine trim cover. Please refer to "the intake manifold".

⑥ Install the cylinder pressure gage with connector on the spark plug.

⑦ Step the accelerator pedal to the metal, turn the ignition switch to the "START" position to start. When the instrument pointer stables, read compression pressure, and engine rotate speed. Perform these steps to check the rest of the cylinders.

Standard Pressure: 1500 kPa

The minimum pressure: 1200 kPa

The allowed values between the cylinders: not larger than 150 kPa

Caution:

Always use a fully charged battery to get the specified engine speed.

If the compression pressure is lower than the minimum value, please check valve clearance, and other related components (valves, valve seat, piston, piston ring, cylinder diameter, cylinder head and gasket). After checking, measure the compression pressure again.

If some of the cylinders' compression pressure is low, please fill a small amount of the engine oil to the spark plug hole of the cylinder, and re-check the cylinder pressure.

-- If you add engine oil, the cylinder pressure has increased; the piston rings may be worn or damaged. Check piston rings, if necessary, replace it.

-- If you add engine oil, the compression pressure is still low, the valve may be faulty. Check valve for damage. Replace the damaged valve or valve seat.

If the two adjacent cylinder compression pressure is low, and after adding the oil

pressure is still low, may be the cylinder head gasket has the leaking. Replace cylinder head gasket.

⑧when the inspection is completed, please install the parts and components that have been removed.

⑨ Start the engine and verify engine running smoothly.

2、Disassembly and installation:

1）Disassembly

① Release the fuel pressure; please refer to "Release the fuel pressure"

② Drain engine coolant and the engine oil Please refer to “Changing engine coolant”and "Changing engine oil".

Caution:

Do not perform this step until engine cools down.

Please do not spill engine coolant and the engine oil on driving belts.

③ Disassemble the following components and related parts and components.

Driving belts please refer to the "driving belt".

The oil pumps assembly and the timing mechanism. Please refer to "Timing chain wheel body".

The engine trims cover. Please refer to "the intake manifold".

The valve cover, please refer to the"camshaft assembly".

The intake manifold, please refer to "the intake manifold".

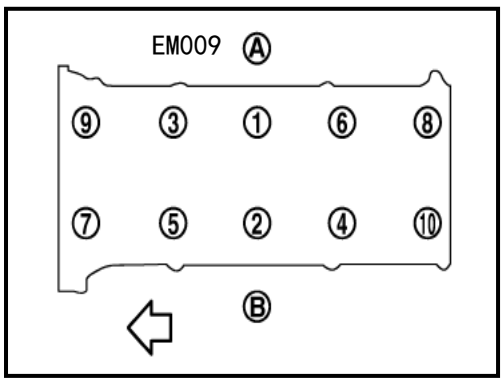
Exhaust manifold. Please refer to the "exhaust manifold".

The thermostat shell, Please refer to the "thermostat subassembly".

The oil dipstick conduit

④ Loosen the cylinder head bolts.

Disassembly order reverses with the shown in figure 11.043.



A: The air inlet side

B: Exhaust side

⇦: Front of Engine

⑤ Disassemble cylinder head gasket

2) Inspection after disassembly

① Cylinder Head Bolt

Measure the length of cylinder head bolt.

The limits are: 143.5 ±0.7 mm, if it exceeds the threshold value, please replac it.

② Cylinder head cover

Check the cylinder head for cracks or other damages.

Check the the watercourse of the cylinder head, and the oil for restriction, if there is restriction, please clean them.

Check the cylinder head flatness.

Note: Perform this check, and check the cylinder for flatness. Please refer to the "Block Plane".

a. Wipe clean the oil on the cylinder cover, as well as clear the sealant and carbon deposits, and so on.

Caution:

Take care and do not allow debris falling into the cylinder head watercourse and oil passages.

b. Measure the orientation of 6 planes on the mutiple positions of the bottom surface on of the cylinder head.

Standard Value: below 0.03 mm

Cylinder head height (new): 158 + /- 0.5 mm

If it exceeds the standard value, please grinding or replace it according to the specifications.

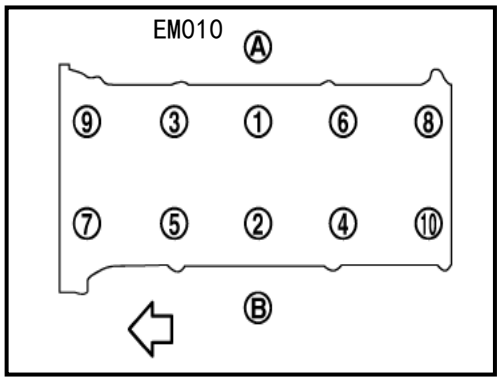
Caution:

The total remaining amount that can be ground of the mating surface between cylinder head and block is less than 0.2 mm.

3）Installation

① Install the new cylinder head gasket.

② Screw it in accordance with the numerical order as shown in the diagram on the right.

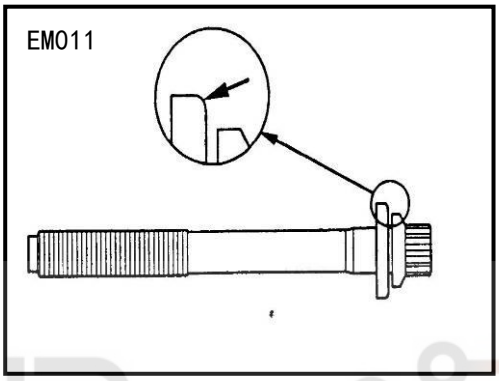


Tighten cylinder head cap screws, and install cylinder head as the following steps.

A: The air inlet side

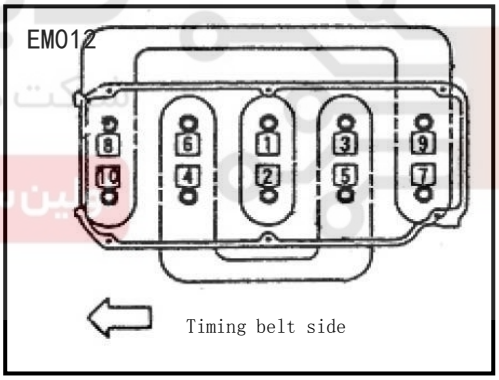
B: Exhaust side

⇦: Forepart of Engine



a. Install the gasket as shown in Figure 1.1.046.

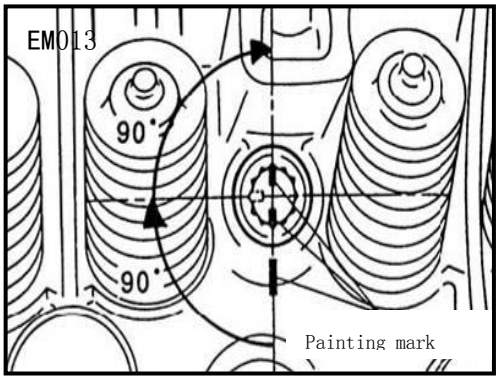
b. Smear the threads and the gaskets of the threads of the bolts with appropriate engine oil.



c. Tighten the bolts in the sequential order as shown in Figure 1.1.047., until each bolt torque reach to 24.5 ±2N m.

d. Loosen the bolts entirely.

e.Re-tighten the bolts in the sequential order as shown in Figure 1.1.047, until each bolt torque reach to 24.5 ±2N m.



f. Smear the head of the cylinder cover bolt

and cylinder cover with paint marks.

(As shown in Figure 1.1.048)

g. Tighten each bolt in the 90 angle according to the tightening sequence

h. Tighten each bolt in 90 angles again, and check whether paint marks on the bolt head align with cylinder head.

Caution:

If the tightening angle of the bolts is less than 90 angles, they are not likely to have sufficient forces to tighten cylinder cover.

If the tightening angle of the bolts is greater than 90 angle, they should be completely disassembled, and then re-install them.

i. If replace the old cylinder cover bolts during the process of repair, please repair them in accordance with the above steps a-h.

i. If do not replace the old cylinder cover bolts during the process of repair, please repair them in accordance with the above steps a、b、e、f、g、h.

Installation is the reverse order of removal.

4 Inspection after installation:

The following steps are to check the fluid leaks step, oil leaks step and exhaust leaks step.

Before starting the engine, please check engine coolant and engine oil/fluid level. If it is less than the required amount, please fill till the assigned position.

Use the following steps to check for fuel leaks.

- Turn the ignition switch to the "ON" position (when the engine shut down). Check whether the connections has fuel leak or not.

Start the engine Start engine, and re-check for fuel leaks at connections again when the engine speeds up.

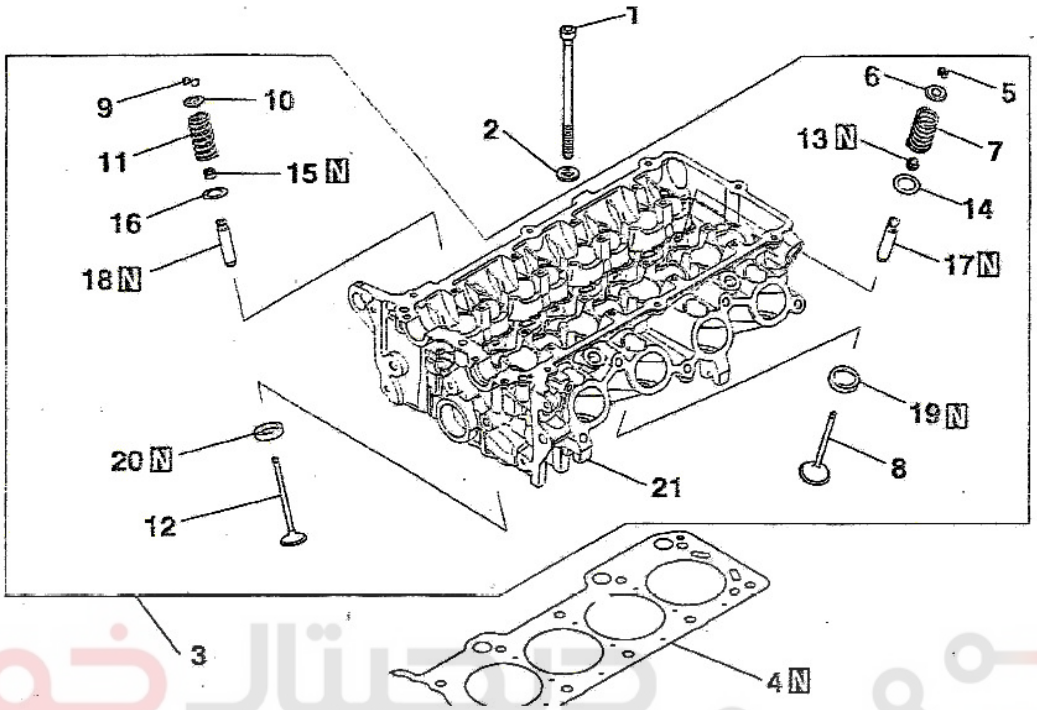
Run the engine to check for abnormal noise and vibration.

To warm-up the engine thoroughly, confirm that there is no fuel, exhaust or any fluid leaks (including the engine coolant and engine oil leak).

After the engine cools down, please re-check the oil level (including the engine oil and engine coolant). If necessary, re-fill to the assigned level.

Valve

1、Component description:



Valve components figure

1-Cylinder cover bolt 2-Cylinder cover bolt gasket 3-Cylinder cover assembly 4-Cylinder cover gasket 5 - Intake valve clamp 6 - Intake valve spring seat 7 - Intake valve springs 8 - Intake valve 9 - Exhaust clamp 10 - Exhaust valve spring seat 11 - Exhaust valve spring 12 - Exhaust valve 13 - Intake valve seal 14 - Intake valve spring seat 15 - Exhaust Valve Seal 16 - Exhaust valve spring seat 17 - Intake pipe 18 - Exhaust valve guide 19 - Intake valve seat ring 20 - Exhaust valve seat ring 21 - Cylinder Cover

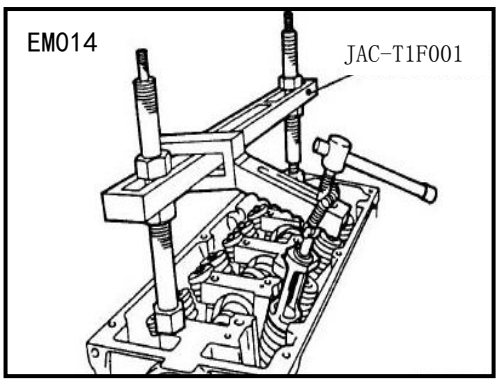
2、Disintegration and Assembly

1) Disintegration

① Use the spark plug sleeve to disassemble the spark plug.

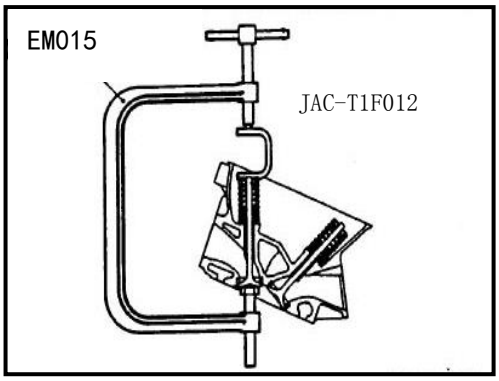
② Disassemble valve locks, valve springs and valve spring seat.

Use the valve spring compressor to compress valve spring.



Caution:

Pay attention to the position of top dead center of the piston.

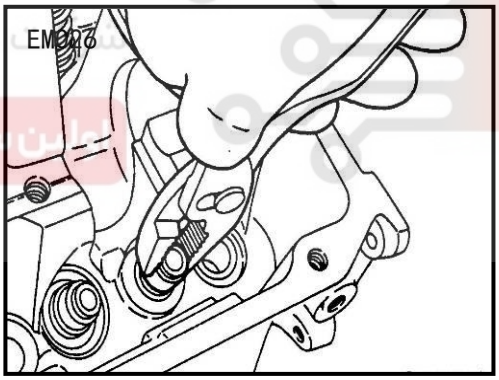


Make labels on the disassembled valve, valve spring and other parts and components,

Please note cylinder number and location.

Store the components safely.

③ Disassemble the oil seal of the valve.



④ If you must replace valve seat. Please refer to the "replacement of valve seat", and disassemble them.

⑤ If you must replace valve seat. Please refer to the "Valve guide pipe" to disassemble.

2) Assembly

① Install valve guide, please refer to the "valve guide pipe".

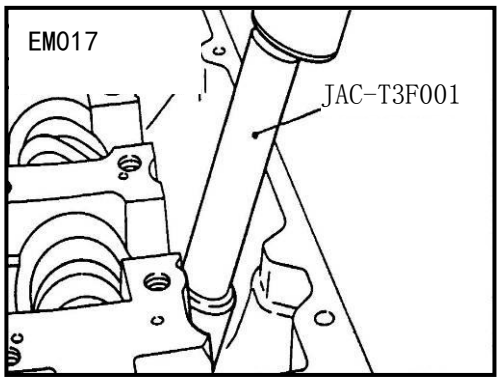
② Install valve seat, Please refer to the "valve seat",

③ Install valve oil seal

a. Install valve spring seat.

B. Install the special tools as figure 1.1., 052 shows.

New valve oil seal.



Caution:

The valve seal can not be re-used.

Must use the correct special tools to install valve oil seal

④ Install valve

⑤ Install valve spring

Note: The valve and valve spring with paint mark should be installed upwards.

⑥ Install valve spring maintaining seat

⑦ Install valve locking plate

Use the valve spring compressor to install.

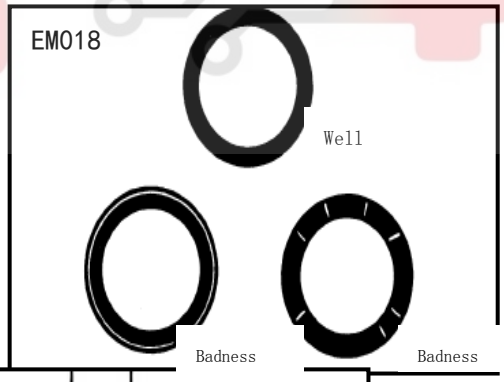
After installation, check it with a rubber hammer by gently tapping the edge of valve stem.

⑧ Use the spark plug sleeve to assemble the spark plug.

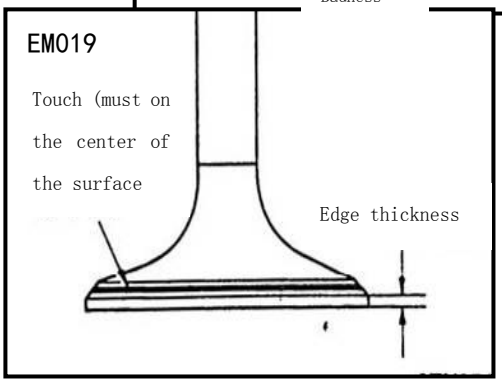
3) Inspection after disintegration:

1. Valve

Check valve face whether it has correct touch or not. If the touch is uneven, or is incomplete, Please refurbished valve seat surface.



Check the thickness of the valve edge. If it is not within the set values, please replace the valve.



Intake valve: 1.35 - 1.65 mm.

Exhaust Valve: 1.85 ±0.15mm

Check the overall length of the valve. If it is not within the set values, please

replace the valve.

Intake valve: 89.51 - 90.01 mm.

Exhaust Valve: 90.69 - 91.19 mm

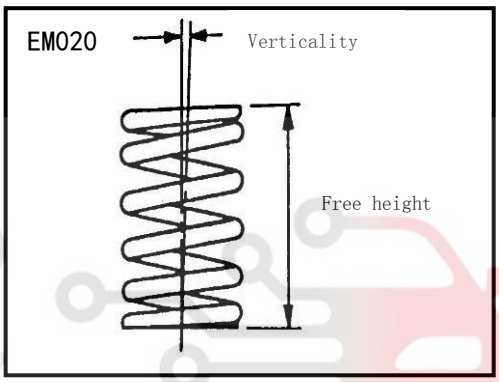
2. Valve Spring

Check the free height of the valve spring. If it is less than the specified value, please replace valve spring.

Standard Value: 43.1 mm

Limits: 50.37 mm

Check the verticality of the valve spring. If it exceeds limits, replace the valve spring.



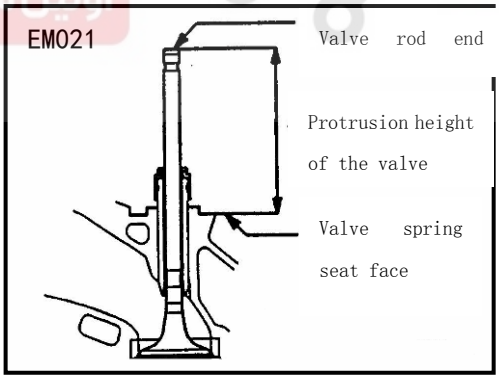
Standard Value: 2 °

Limits: 4 °

4. Valve Seat

Check the valve protrusion height between the end face of the valve rod and the surface of the valve spring seat. If it exceeds the limit value,

Please replace valve seat.



Standard value:

Intake valve: 53.21 mm

Exhaust Valve: 54.10 mm

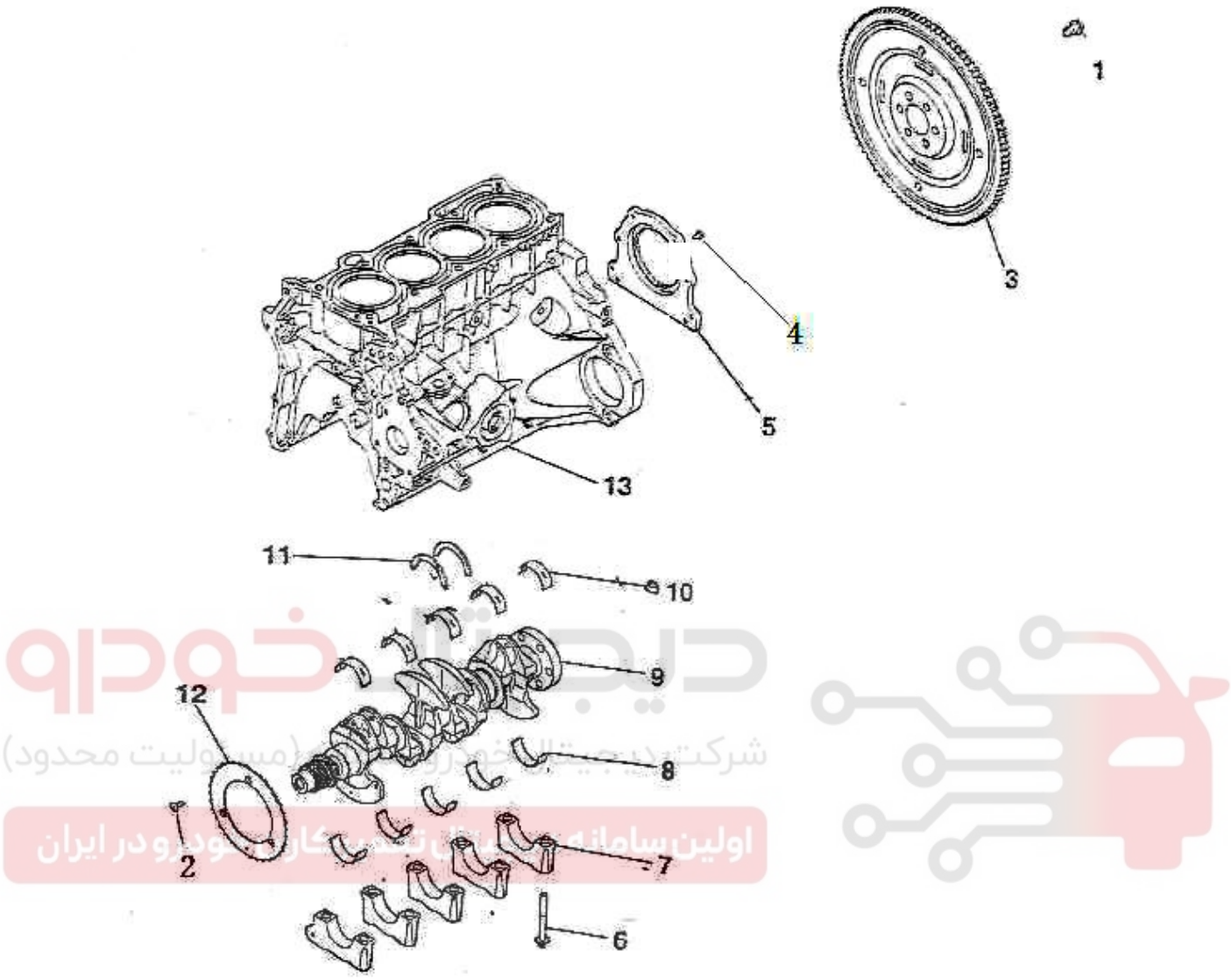
Limits:

Intake valve: 53.71 mm

Exhaust Valve: 54.60 mm

Cylinder block assembly

1、Component description:



Cylinder block assembly breakdown drawing

1 - Flywheel bolts 2 - Signal wheel screws 3 - Flywheel 4-Crankshaft oil seal bolts 5 - Crankshaft oil seal shell 6 - Bearing cap screws 7-Bearing cap 8 - The upper main bearing shell 9-Crank 10 - The down main bearing shell 11 - Crank the cone piece, 12 - Crank signal wheel 13-Cylinder block

2、Disintegration and Assembly

1) Disintegration

① disassemble the engine assembly from the vehicle, and then remove the transmission from the engine. Regarding the specific separation process, please refer to the engine assembly.

②Disassemble the engine accessories, about the specific disassembling process, please refer to the relevant chapters.

The engine air intake manifold and the engine exhaust manifold

The generator belts

The generator

Timing chain wheel body of the engine

The water pump

The water pipe subassembly

The generator mounting bracket, air conditioning compressor mounting bracket

Ignition coil

③ Fix the overall engine.

④ Drain engine oil, please refer to "Changing engine oil".

⑤ Disassemble flywheel assembly, please use the special tool to fix flywheel, and then disassemble the fixed bolts and spacer plate.

Tighten the torque: flywheel: 95～105N ṁ.

The spacer plate: 8～12 N ṁ.

Caution:

- Do not place the signal plate of the crankshaft position sensor on the flywheel facedown.

The mounting bolts should be released in diagonal order.

⑥ Disassemble the following system. About the specific disassembling process, please refer to the relevant chapters.

The cylinder cover

The oil pump shell

Oil pan

⑦ Disassemble knock sensor.

Tighten the torque: 16～24 N ṁ

Caution:

-- Do not fall or tap sensors.

⑧ Disassemble the rear oil seal holder.

Tighten the torque: 7.0～70N ṁ

Put the screwdriver between the crankshaft and the rear oil seal to disassemble.

Caution:

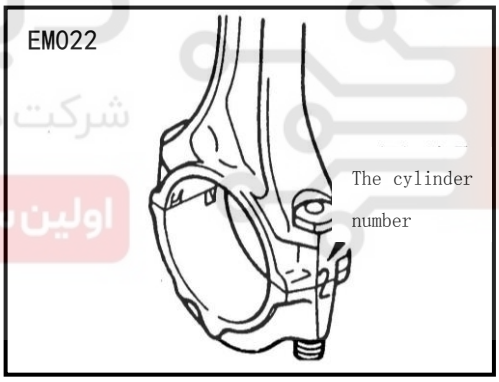
Once the rear oil seal has been disassembled, and cannot be used again, please replace it with new parts.

⑨ Disassemble the piston and the connecting rod assembly.

Disassemble the piston and the connecting rod assembly; please check the clearance of connecting rod big end. Please see below "Inspection after disassembly":

a. Turn crank, and put the crankshaft journal corresponding to the connecting rod that to be disassembled in the middle of the bottom.

Note: In order to re-install, you can print the cylinder serial number on the side face of the connecting rod big end which could be disassembled.



b. Disassemble the connecting rod cover.

Tighten the torque: 15±2N ṁ + 92 °～94 °

c. Use a rubber mallet or similar tools to push the piston, and the connecting rod assembly out of the cylinder cover side.

Caution:

Be careful not to let connecting rod big end damage the cylinder walls and crankshaft journal.

⑩ Disassemble the connecting rod bearing shell from the connecting rod and the connecting rod cover.

Caution:

Identify the location position, and place them on the right place, and do not get

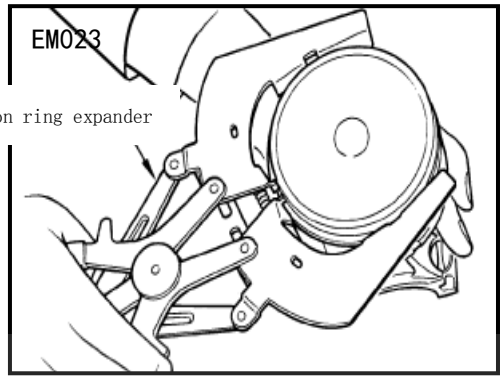
confused.

⑪ Disassemble the piston rings from the piston.

Check piston ring side clearance before disassemble the piston rings. Please see below "Inspection after disassembly":

Caution:

Use the piston ring expander.



⑫ Disassemble the piston from the connecting rod as the following methods:

a. Insert push rod from the previous arrow marking side

(Special tools), then install the guide sleeve D.

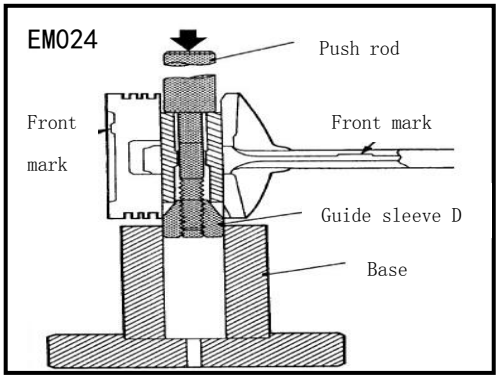
b. Put the front mark of the piston upwards, and assemble the connecting rod assembly in the installed base of the piston pin

(Special tools)

c. Pinch out the piston pin by using the press machine.

d. Separate the connecting rod and the piston from the piston and the connecting rod assembly.

Caution:



After disassembling the piston pin, put piston, piston pin, and the connecting rod together.

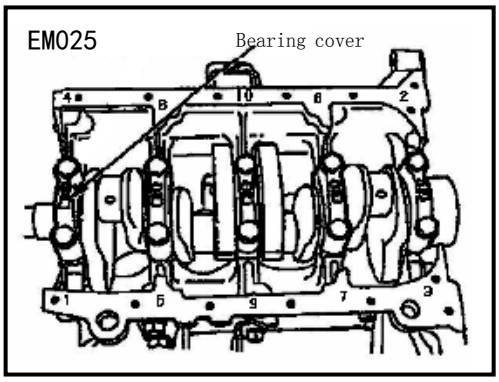
Must not put the cylinder piston, piston pin or connecting rod together

⑬ Disassemble crankshaft bearing cover

Measure crankshaft end clearance before loosening crankshaft bearing cover, . Please see below "Inspection after disassembly":

Loosen the crankshaft bearing cover bolts in the following order.

Tighten the torque: 35±2 N·m+60°～64°



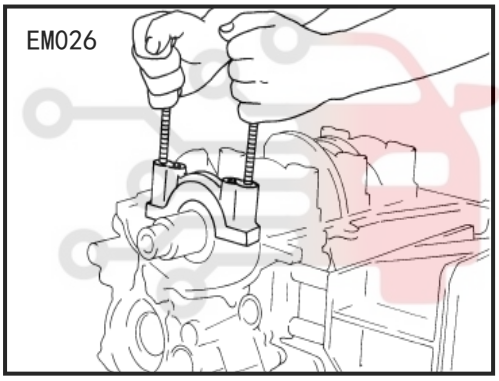
As the figure 1.1.065 shows:

Upper 4 8 10 6 2

Lower 1 5 9 7 3

As shown in Figure 1.1031, when disassembling, please use crankshaft bearing cap bolts to waggle crankshaft bearing cap back and forth in order to disassemble it.

⑭ Disassemble crankshaft

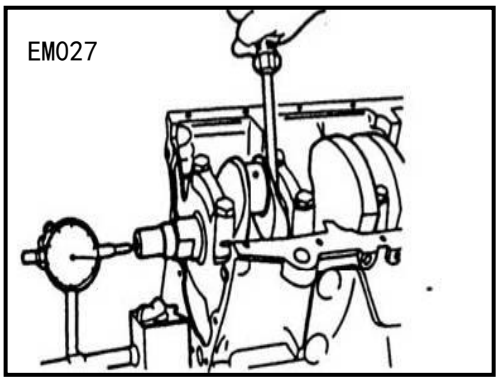


2）Inspection after disintegration:

① Crankshaft end clearance

When the crankshaft moves back and forth toe the end the along with the dial indicator,

Measure the main bearing shell in the center and the clearance among the crank arms.



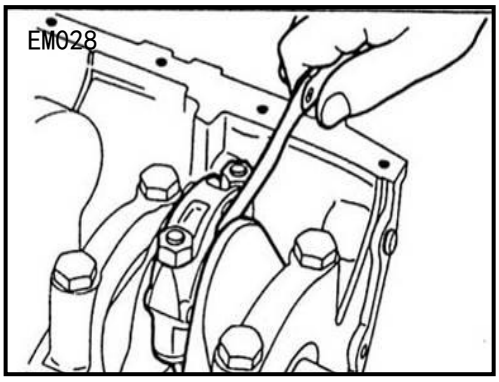
Standard: 0.05～0.18mm

Limit: 0.25 mm

If the measured value exceeds the limit, please replace the main bearing shell in

the center, and restart the measurement. If it is still exceed the limit, please replace the crankshaft.

② Connecting rod big end clearance



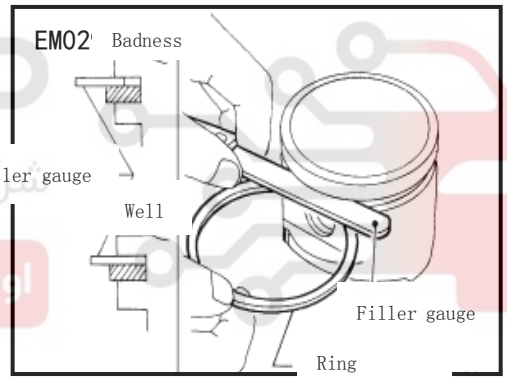
Use a filler gauge to measure the clearance between the connecting rod and crank arm.

Standard: 0.10～0.25mm

Limit: 0.4 mm

If the measured value exceeds the limit, please replace connecting rod, and re-measure. If it is still exceed the limit, please replace the crankshaft.

③The side clearance of piston ring



Use the filler gauge to measure piston ring and the side clearance of the piston ring groove.

Standard:

The first groove: 0.03～0.07mm

The second groove: 0.02～0.06mm

Limits:

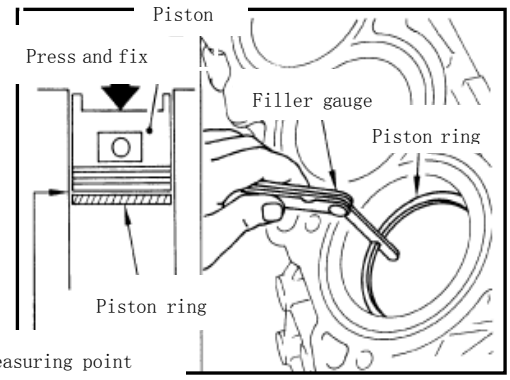
The first groove: 0.1mm

The second groove: 0.1mm

If the measured value exceeds the limit, please replace the piston ring, and restart the measurement. If it is still exceed the limit, you still have to replace the piston.

④ Piston ring end gap

Confirm that the cylinder inner diameter is within the assigned range. Please refer to the "Cylindricity".



Use the new oil to lubricate the piston, and piston rings then insert the piston ring till the middle part of the cylinder, and use the filler gauge to measure piston ring end gap.

Standard:

The first groove: 0.15～0.30mm

The second groove: 0.30～0.50mm

Limits:

The first groove: 0.8mm

The second groove: 0.8mm

If the measured value exceeds the limit, please replace the piston ring, and restart the measurement. If it is still exceeding the limit, and the bore the cylinder inner diameter, please use the appropriate piston and piston rings.

⑤ The flatness of the block.

Clean the pad on the block surface, as well as engine oil, incrustation, carbon and other contaminants.

Caution:

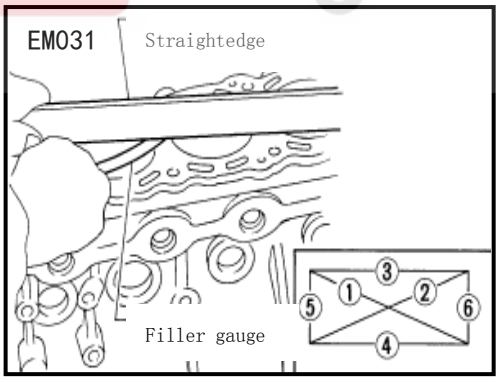
Be careful! Do not allow gasket sheet falling into the engine oil or the engine coolant.

Use a straight ruler and a filler gauge in the different directions of 6 positions to measure cylinder cover flatness.

Standard Value: below 0.03 mm

Limit value: below 0.1 mm

If it exceeds the limit value, please replace cylinder block.



⑥ Cylindricity of the cylinder

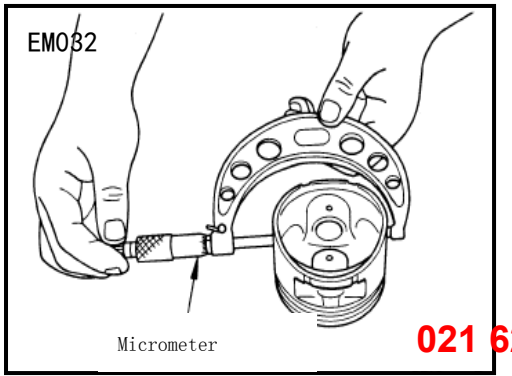
Use the dial indicator to measure the cylinder diameter at 6 different points of each cylinder, to check for wearing, out-of-round and cylindricity.

Standard Values: cylinder inner diameter: 75.000 - 75.015 mm

Cylindricity: Less than 0.01 mm

⑦ Piston skirt diameter

Use the outside micrometer to check



piston skirt is whether deform or not.

Standard Value: 74.973 ±0.005mm

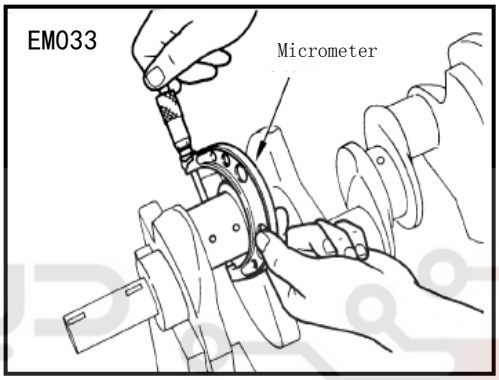
⑧ The clearance between piston and cylinder diameter.

Calculate through the skirt of the piston and the cylinder innner diameter.

(Clearance) = (cylinder inner diameter) - (piston skirt diameter)

Standard Value: 0.02 ~ 0.04 mm

If calculated value exceeds the limit, please replace the piston and piston ring assembly.



⑨The diameter of the crankshaft main journal

Use the outside micrometer to check the diameter of the crankshaft main journal.

Standard: 46.009 - 46.029 mm

If it exceeds the standard, please replace main bearings.

⑩The journal diameter of connecting rod

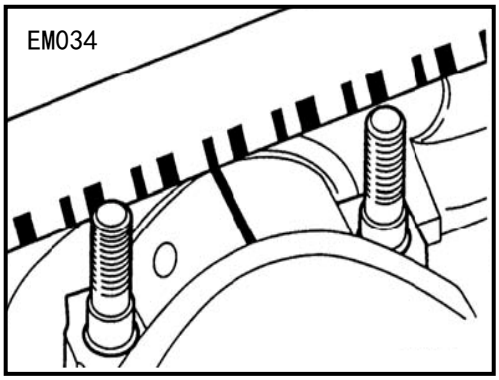
Use the outside micrometer to measure the main journal diameter of the connecting rod.

Standard Value: 39.975 - 40.0 mm, if it exceeds the standard, please replace connecting rod. Divide the main shaft of the connecting rod as the following table:

Group Number	Mark	Size (mm)
1	1	46.024-46.029
2	2	46.019-46.024
3	3	46.014-46.019
4	4	46.009-46.014

5	5	46.004-46.009

⑪The clearance of the connecting rod bearing shell



Note: Use a plastic wire gauge to measure.

a. Wipe off all the engine oil on the connecting rod journals and connecting rod bearing shell.

b. Put the plastic wire gauge on the rod journals, it can be cut in length the same with the width of the bearing shell. Plastic wire rails must be located in the center of the connecting rod journals, and parallel with its axis

c. Gently place the connecting rod covers on their positions, and tighten the bolts to the specified torque.

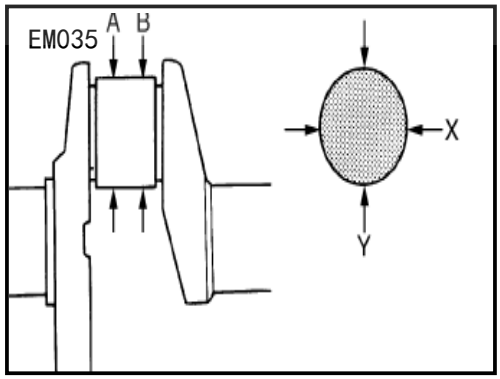
d. Disassemble the bolts, and slowly remove the connecting rod cover.

e. Use the ruler printed on the plastic wire gauge bag, to measure the extrusion part at the widest point.

Standard Value: 0.02～0.04mm

Limit value: 0.1mm

⑫ Out-of-roundness of the crank and cylindricity



As shown in the figure, use the outside micrometer to measure each crankshaft main bearing journals and 4 different points' size of the connecting rod crankshaft main journal.

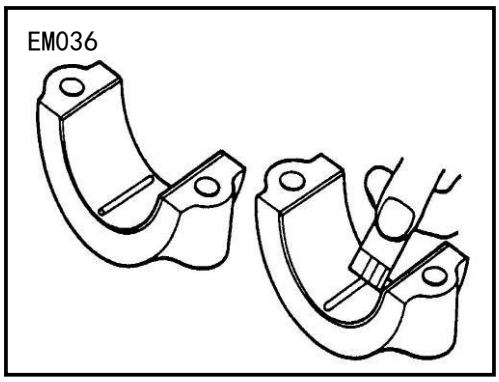
Use the different sizes to show the out-of-roundness among the "A" and" " B 's "X " and " " Y.

Use the different sizes to show the cylindricity among the "X" and "Y"'s "A" and " B".

Limits: Out-of-roundness: no more than 0.05 mm

Cylindrical degrees: Less than 0.05 mm

If the measured value exceeds the limit, please correct or replace the crankshaft.

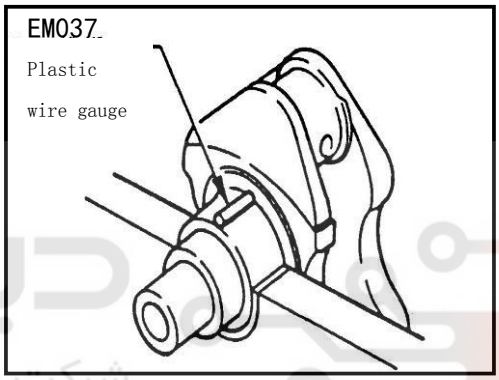


⑬ Crankshaft clearance

a. Wipe off all the engine oil on the surface of crankshaft journal and inside the bearing shell.

b. Install the bearing shell.

c. Cut the plastic wire gauge into the length that matching with the bearing shell. Put it on the bearing journal along the axis of the bearing journal.



d. Gently assemble the crankshaft bearing cover, and tighten the bolts to the specified torque.

e. Disassemble the bolts, and gently remove the crankshaft bearing shell.

f. Use the ruler printed on the plastic wire gauge bag, to measure the extrusion part at the widest point.

Standard Value: 0.02～0.04mm

Limit value: 0.1mm

Caution:

The crankshaft rod journals and crankshaft main journal have been rolled down, and don't have to process to the reduced size.

⑭ Flywheel

Check the flywheel and signal plate for deformation or cracks.

Caution:

-- Do not disintegrate flywheel.

- Do not place the flywheel's signal plate facing down.

When processing the signal plate, be careful not to damage or scratch it.

Do not magnetize the signal plate when processing it. If it is magnetized, please change the flywheel.

3) Assembly

① Blown out the crankcase engine coolant and engine oil in the cylinder block, cylinder diameter, and crankcase.

Caution:

To use safety goggle to protect your eyes

② Install the main bearing shell and the middle bearing shell as shown below.

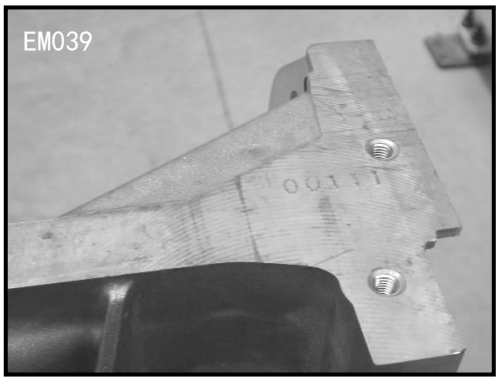
Caution:

Select bearing shell in accordance with the identification mark or color code of the crankshaft (refer to the following table). If they can not be recognized, you should measure the shaft diameter of crankshaft, and select the appropriate bearing bush to match.

Print the packet mark on K face of crankshaft (seen as figure 1.1.043), the packet marking has 10 digits, the first five digits respectively corresponds from the first main journal to the fifth; the sixth digit is printed "B", showing that the packet is finished. The packet of rod journal starts;

From the seventh digit to the tenth digit respectively corresponds the first rod journal to the fourth.

The size of spindle hole is labeled on exhaust back-end on the lower part of the engine block.



Mark (refer to Figure 1.1.044), respectively, corresponding from the first spindle hole size, to the fifth spindle hole size.

The main bearing shell should be

selected and matched as the table stipulate.

Packet marking of Main bearing bore	Packet marking pf Crankshaft				
	1	2	3	4	5
0 (up/down)	Black/Black	Black/Yellow	Black/Red	Black/White	Black/Purple
1 (up/down)	Yellow/Black	Yellow/Yellow	Yellow/Red	Yellow/White	Yellow/Purple
2 (up/down)	Red/Black	Red/Yellow	Red/Red	Red/White	Red/Purple

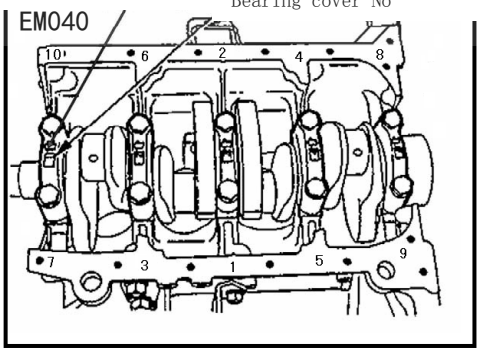
When installing, align the bulge of the bearing bush with the kerf of the main bearing shell.

Confirm that the oil holes in the cylinder block have been aligned with the oil hole on the bearing shell.

③ Crankshaft is installed on cylinder block. When turning crankshaft by hand, please check whether the turning is flexible.

Arrow pointing to timing side of the engine

Bearing cover No



④ Install the main bearing shell.

Through the identification mark can identify main bearing shell.

From the timing belt side, install the main bearing shell in accordance with the sequence.

The arrow must point to timing belt side.

⑤ Tighten main bearing bolts as the right digitals show in the diagram.

a. Use the new engine oil smear the threads and mounting surface of the main bearing shell bolts.

b. Tighten main shell bolts by multi-steps.

Tighten the torque: 35±2N m

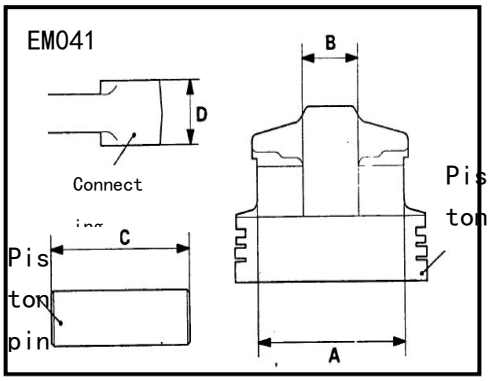
c. Turning all bearing shell bolts in clockwise order of 30°.

After installing the main bearing cap bolts, confirm that the crankshaft can be rotated flexibly by hand.

Check crankshaft end clearance Please refer to" crankshaft end clearance".

⑥ Install piston onto the connecting rod as shown below

a. Measure the length (as shown in the following figure)



A: The dimension from the piston to piston boss outside face.

B: The dimension from the piston to piston boss inside face.

C: Piston pin length

D: Connecting rod small end thickness

b. Put the measurement value into the following formula:

L= [（A-C）-(B-D)]/2

c. Insert the push rods (special tools) into the piston pin, and then put it into the guide sleeve A (special tools)

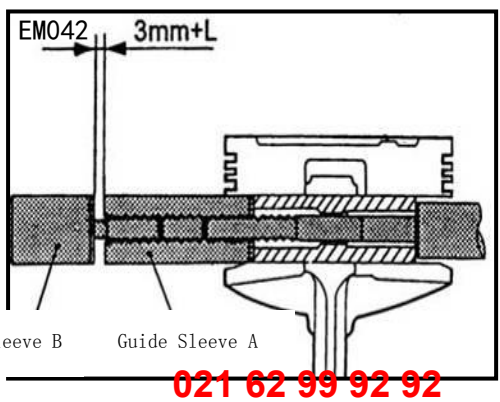
d. The front mark should be on the same side, when installing of the piston and connecting rod.

e. Smear the engine oil on the out circle of the piston pin.

f. From the guide sleeve A, press the guide sleeve A, piston pin and push rods in the the front side marker of piston.

g. Tighten guide sleeve B into A, between the two guide sleeves, the clearance of it is equal to 3mm plus L value that calculated in the second step.

h. In the state of the piston front marker facing down, install the piston and connecting rod assembly into the piston pin installed base.



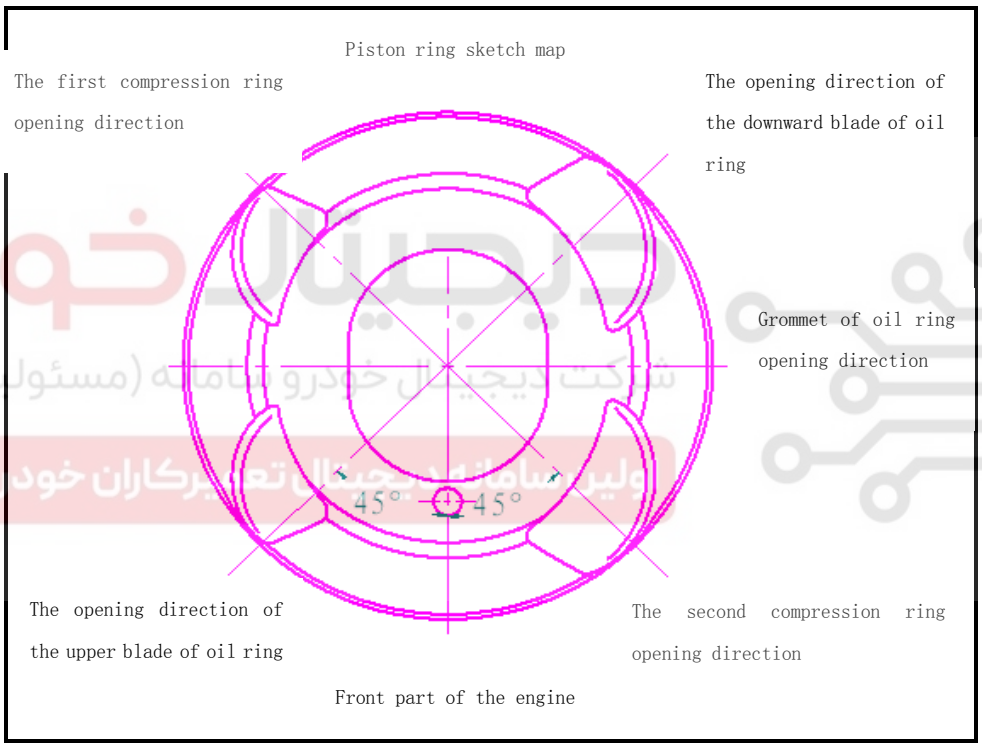
i. Install the piston pin by press machine.

Caution:

If the press-fit load exceeds requirements, replace the piston pin and piston assembly and connecting rod, or both.

Standard Value: 108±54N·m.

⑦ Install piston ring, the installation position of piston ring seen as the figure shows



Caution:

When installing the piston ring, be careful not to damage the piston ring.

Be careful not to damage the piston ring due to the over-expansion.

⑧ Install the connecting rod bearing shell onto the rod and the rod cap.

Read the connecting rod packet marking as the figure shows identification, select bearing shell as shown in the following table.

Crankshaft rod journals		The selection of connecting rod bearing shell	
Mark	Size (mm)	Mark	Thickness (mm)
1	39.992 - 40	1 (yellow)	1.487 - 1.490
2	39.984 - 39.992	2 (black)	1.490 - 1.493
3	39.975 - 39.984	3 (red)	1.493 - 1.496

■ Before installing connecting rod bearing shell, please use the engine oil to smear the bearing surface. Do not use the engine oil.

Smear the back, but to thoroughly clean the back.

⑨ Disassemble the piston and the connecting rod assembly onto the crankshaft.

a. Put the crankshaft journal corresponding to the connecting rod that to be disassembled, in the middle of the bottom.

Use the enough engine oil to smear the cylinder diameter, piston and crankshaft journal.

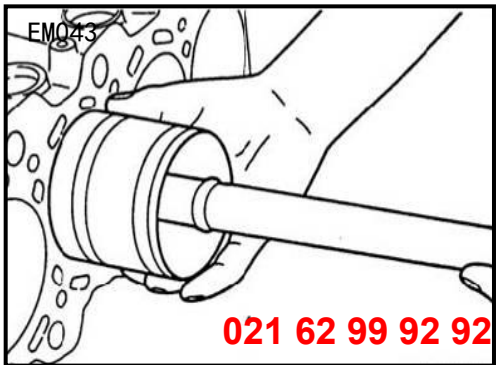
-- As 1.1.049 figure, aligned with the opening of the air ring and oil ring.

When installing the cylinder, please correspond to the position of it with the connecting rod mark which is to be installed.

Make sure the previous mark of the piston top facing toward timing chain side; press the piston and the connecting rod in the cylinder from the above head of the cylinder.

Use a piston ring compressor or a suitable tool

Install the piston with the front marks toward the front of engine to the head of the piston.



Caution:

Be careful not to let connecting rod big end damage the cylinder walls and crankshaft journal.

⑩ Install the connecting rod cap.

⑪ Tighten connecting rod bolts, in accordance with the method of "5N.m->10N.m->13N.m+ 45°+ 45°", alternately tighten them. Connecting rod cap can be used only for once, it cannot be re-used.

Caution:

-- If before installing the connecting rod nut, a cylinder cover has been previously installed, you must first disassemble the spark plugs.

When the bolts are re-used, you must check for scratches. When the nut can smoothly tighten all the threads, which can illustrate there are no scratches on the threads of the bolts, otherwise the bolts must be replaced.

Before installing the nuts, please smear the engine oil in the threads of it and its seat surface.

Caution:

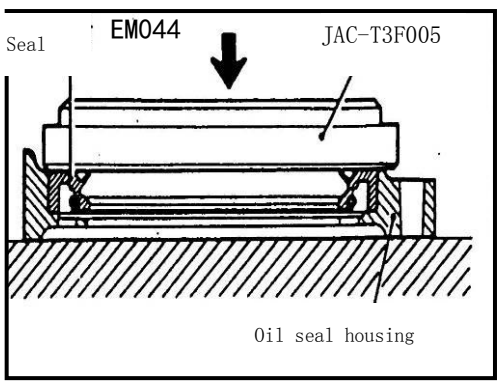
If the nut rotation angle is less than 90 °, the fasten force of the connecting rod may not be sufficient.

If the nut rotation angle is greater than 94 °, they should be completely loosened, and re-tighten.

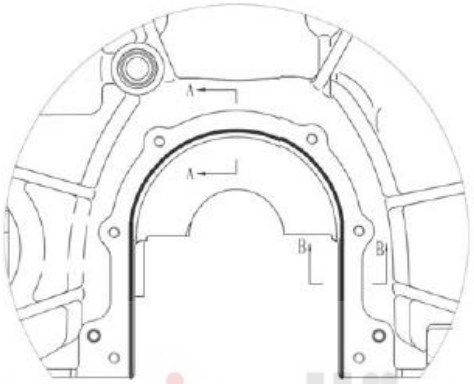
After tightening the connecting rod nuts, confirm the rotation flexibility of crankshaft.

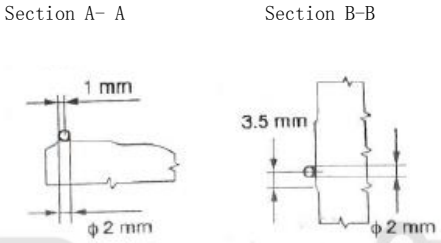
⑫ Install the rear oil seal shell, which has been installed the crankshaft rear oil seal, into the cylinder block.

Use the special tools as shown in the figure; press the rear oil seal into the block.



When installing the crankshaft rear oil seal bracket, ensure that the gluing surface clean, and free of oil, dirt, and so on, and as shown in figure 1.1 .051, smear Dow Corning 3-0115 sealant or equivalent product in the rear mounting surface of the cylinder block, sealant can also be smeared in the corresponding part of the crankshaft rear oil seal bracket. Adhesive diameter 2±0.5mm, smear the lubricating oil on the oil seal lip and the jointing part of crankshaft.





⑬ Install the knock sensor

Caution:

-- Do not tighten the nuts, when holding the connector.

If the knock sensor has been shaken, please replace with a new one.

Note: Be sure that there are no foreign bodies on the matching surface and on the back of the knock sensor.

⑭ please read the following precautions, and install them in the reverse order of disassembly after finishing this step.

The flywheel

Cross-tighten the fixing bolts to specified torque.

Common fault phenomenon diagnosis

Common fault phenomenon diagnosis

Fault phenomenon	The possible reason of fault phenomenon	Troubleshooting.

The cylinder pressure is low	Cylinder head gasket leaking	Replace cylinder head gasket
	Piston rings are worn or damaged	Replace piston rings
	Cylinder or piston worn	Repair or replace the piston or cylinder block
	Valve seat damaged or worn	Repair or replace valve seat
Engine oil pressure is low	Engine oil quantity is less	Check the engine oil quantity
	Oil Pressure Sensor Fault	Replacement
	Oil filter block	Replacement
	The oil pump gear or cover damage	Replacement
	Engine Oil Viscosity is low	Check and replace oil
	Oil pressure switch plunger normally open	Repair
	Bearing Clearance is large	Replacement
Engine oil pressure is high	Oil pressure switch plunger normally close	Repair
Engine jitters	Engine mounting bolts loose	Tighten
	Transmission Mounting Bracket is loose	Tighten
	Engine stand looses	Tighten
	Engine heat resistant pad damage	Replacement
	Engine support heat resistant pad damage	Replacement
	Transmission heat resistant pad damage	Replacement
Valve noise	Oil is watery, (oil pressure is low)	Replacement
	Valve or valve guides worn or damaged	Replacement
connecting rod bearing and spindle bearing noise	Oil quantity is low	Check the engine oil quantity is enough
	Oil is watery, (oil pressure is low)	Replacement
	Bearing Clearance is large	Check and determine the reason
Toothed belt noise	Tensioning force is not correct	Adjust tension force.
Cooling effect is poor.	Heat sink or pipe leaky	Repair or replace
	Water tank lid does not seal	Tighten or replace
	Thermostat leak	Replace thermostat gasket
	Radiator leak	Repair or replace
	Water Pump Leak	Replacement
Heat sink is blocked	Coolant has contamination	Replacement
Engine coolant temperature	Water tank lid is not sealed tightly	Replacement

is high	Cooling system is blocked	Clean or replace.
	Thermostat malfunction	Replacement
	Belt slip	Adjust or replace.
	Water pump malfunction	Replacement
	Sensor malfunction	Repair or replace
	Fan malfunction	Repair or replace
	Insufficient engine coolant	Add coolant:
Engine coolant temperature is low	Thermostat malfunction	Replacement
	Sensor or wiring harness malfunction	Repair or replace
Fan does not work	Sensor or starter damage	Repair or replace
	Fan relay or wiring harness damaged	Repair or replace
Exhaust air leaks	Connecting points loose	Tighten
	Exhaust Pipe or muffler damage	Repair or replace
Abnormal noise	The muffler looses	Replacement
	Rubber pads falling off	Replacement
	Exhaust Pipe or muffler is connected with car body	Correction
	Exhaust pipe or muffler damage	Repair or replace

Service Parameters

1、Tighten torque

Name	Quantity	Tighten torque (N ·M)
Main Bearing Shell Bolt	10	(35±2)N.m+60°～64°
Connecting Rod Bolts	8	5N.m->10N.m->13N.m+ 45°+ 45°
Camshaft Bearing shell bolts	16	11±1
The front bearing shell bolts of camshaft	3	20±1
Cylinder Head Bolt	10	（24.5±2） N.m +180°～ 184°
Crankshaft pulley bolt	1	（50±2） N.m +60°±2°
Flywheel bolts	6	100±5
Exhaust Camshaft Sprocket Bolt	1	88±5
Valve timing adjusting bolt	1	70±5

Crankshaft Rear Oil Seal Bolts	6	
The rear lifting lug bolts	2	18.4±1.4
The intake manifold bolts	5	18±1
Oil pan bolts	14	11±1
Sprocket Cover Bolts I	2	39.5±3.0
Sprocket Cover Bolts II	2	39.5±3.0
Sprocket Cover Bolts III	2	8.4±0.6
M 6 * 20 E 10 model bolt	6	8.4±0.6
M 6 * 12 E 10 model bolt	7	8.4±0.6
When the above two bolts securing oil filter bracket		11.5±1.1
Cylinder Head Bolts and Bracket Bolts	10	9±1.0
M 6 * 45 E 10 model bolt	2	8.4±0.6
M 6 * 25 E 10 model bolt	9	8.4±0.6
M 6 * 12 E 10 model bolt	1	8.4±0.6
Oil filter braclet bolts	3	20±1
warm water steel tube bolts	2	7.6±0.6
Oil pressure rail bolt	2	18.4±1.4
Main oil galley plug I	2	60±5
Main oil galley plug II	1	35±5
Drain plugs	1	25±5
Oil Galley Plug	1	20±5
VVT oil blockage	1	44±5
Oil drain plug	1	39±5
The rail bolt components	2	10±2
The rail bolt components	1	23.5±4.5
Starter bolts	2	24±3
Oil pressure switch	1	10±2

Spark plugs	4	25～30
Exhaust manifold dual-head stud	6	12±2
Catalytic convert heat shield nuts	3	10±1
Crank signal wheel bolts	3	12.5±2.5
Water temperature sensor	1	20±4
Hall sensors bolt	1	8.4±0.6
Knock sensor bolt	1	20±4
Exhaust manifold bolt	5	35±2
Throttle self-tapping screws	4	6±0.5
Absolute pressure sensor self-tapping screws		6±0.5
Square head bolt	1	47±5
Idler Wheel Bolts	1	49±9
Oxygen sensor	2	35±5
Oil Filter	1	11±01

The standard parts and the threaded connections that the ablve table is not provided for:

M6： 9 ～ 11N.m M8: 20 ～ 25N.m M10: 30 ～ 50N.m

M12：60～80N.m

2. Technical Parameter

Project		Standard value	Limit value
Camshaft			
Camshaft height (mm)	The air intake	44.7054±0.1mm	
	Exhaust	44.2836±0.1mm	
Cylinder Head and Valves			
Cylinder head gasket surface flatness (mm)		Below 0.03	0.1
Cylinder head cover total height (mm)		112.9～113.1	-
The thickness of the valve	Intake valve	1.35	0.85

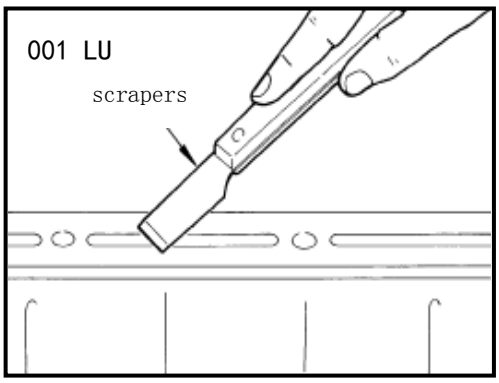
edge.	Exhaust Valve	1.85	1.35
Valve stem diameter (mm)		φ5.5	-
Clearance between valve stem and valve guide (mm)	The air intake	0.020～0.036	0.10
	Exhaust	0.030～0.045	0.15
Valve cone		45°～45.5°	-
Valve stem overhang (mm)	Intake valve	53.21	53.71
	Exhaust Valve	54.10	54.60
The overall length of the valve.	Intake valve	89.61	89.11
	Exhaust Valve	90.94	90.44
Valve spring free height (mm)		43.1	42.7
Valve spring load/mounting height (N) / (mm)		152/33.4	-
		310/25.2	-
Valve Spring verticality		Less than 2°	4°
Valve seat contact width (mm)		0.9～1.3	-
valve guide inner diameter (mm)		φ5.5	-
Valve guide overhang (mm)		13±0.3	-
Oil pump gear top clearance (mm)		0.06～0.18	
Side clearance of the pump (mm)		0.04 ～0.11	
Shell clearance of oil pump (mm)		0.10～0.18	
Out diameter of piston skirt (mm)		74.968～74.978	
The first air ring side clearance (mm)		0.03～0.07	
The second air ring side clearance (mm)		0.02～0.06	
The first piston ring gap clearance-compression (mm)		0.15～0.30	
The second piston ring gap clearance-compression (mm)		0.30～0.50	
Combination oil ring gap clearance (mm)		0.20～0.50	
Piston pin out diameter(mm)		18.0	
Piston pin out diameter(mm)		4900～14700	
Connecting rod journal clearance (mm)		0.02～0.04	0.1
Rod head side clearance (mm)		0.10～0.25	0.4
Crankshaft end clearance		0.09～0.27	
Crankshaft main journal diameter (mm)		46.009-46.029	
Connecting rod journal diameter (mm)		39.975～40.0	
Crankshaft main journal to clearance (mm)		0.02～0.04	
Cylinder head gasket surface flatness (mm)		Below 0.03	
Cylinder block total height (mm)		256	
Cylinder Block cylindricity (mm)		Below 0.01	
Cylinder bore inner diameter		75.000～75.015	
Clearance between piston and cylinder (mm)		0.02～0.04	

Lubrication System

Precautions

Sealant Application Procedure:

1, Using a scrapers, Clear old sealant adhering to the application surface and the mating surface.



Note:

■Clear sealant completely from the groove of the sealant application surface, mounting bolts and bolt holes

2, Clear the sealant application surface and the mating surface with unleaded Petrol to remove adhering moisture, grease and foreign materials.

3, Locate sealant completely to the specified position with the specified dimensions

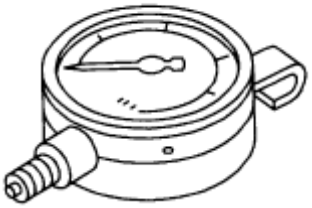
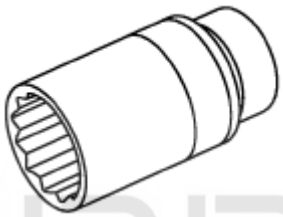
1) Within 5 minutes after liquid gasket application, install the mating component.
2) If sealant has stains, please clean them off immediately.
3) Please do not re-tighten bolts or nuts after the installation.
4) Refill engine oil and engine coolant in 30 minutes after the installation,

Preparations

1、Service tools:

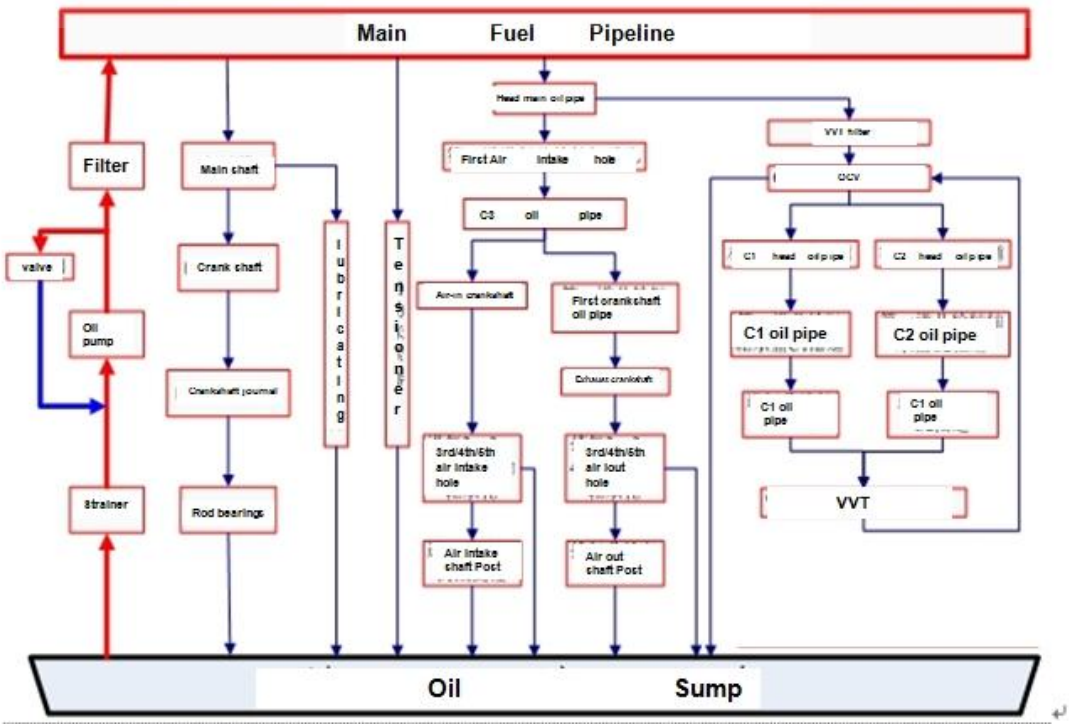
List of Service Tools

SN	Tools	Outline drawings	Descriptions

1	Oil pressure gauge		Measuring oil pressure
2	soft hose		Connecting oil pressure gauge to cylinder block
3	Oil pressure switch socket		Removing and installing oil pressure Switch

Lubrication System Illustrative Diagram

1. 3L Engine Lubrication System Pipelines Diagram



Engine Oil

1, check

1) The level of Engine Oil

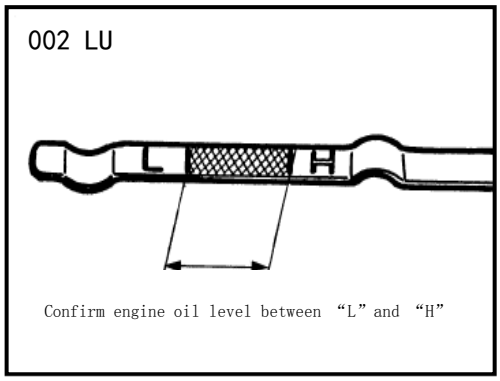
Note: Before starting engine, park vehicle horizontally and firmly, check the engine oil level. If engine is already started, stop it and check it 10 minutes later

① pulls out the Engine Oil

Dipstick and wipe it clean.

②Insert Engine Oil dipstick and

Confirm engine oil level with the range shown in the figure.



③please adjust, if it's out of the range

2) Engine oil appearance

①Check the engine oil for white turbidity or heavy contamination.

②If engine oil appears cloudy or contaminated, it is highly probable that it is contaminated with engine coolant. Repair or replace the damaged parts.

3) Engine Oil leakage

Check for engine oil leakage around the following areas:

■Oil sump

■Oil sump draining bolt

■Oil pressure switch

■Oil filter

■Mating surface between cylinder block and cylinder head

■Crankshaft oil-seals (front and rear)

■The mating surface between Oil Pump and Cylinder Block

■Mating surface between valve vocer and cylinder head

■Front camshaft oil seal

4) Oil pressure check:

Note:

■Be careful not being burnt, as engine oil may be very hot

■Oil pressure check should be done after parking

①Check engine oil level Please refer to"The level of Engine Oil"

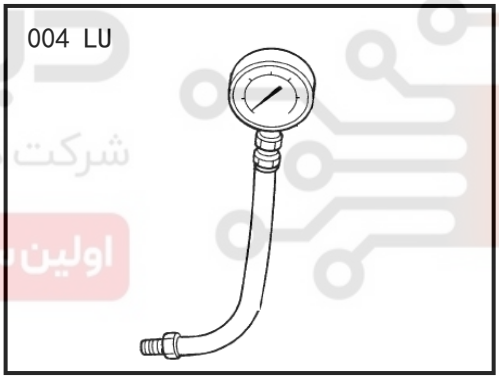
②Lift the vehicle and disconnect the oil pressure switch

Disconnect harness connector at oil pressure switch, and remove the switch.

③Install oil pressure gauge and soft hose

④Start the engine and warm it up to normal operating temperature.

⑤ Check the oil pressure when the engine is idling.



Note: the engine oil pressure is high when the engine oil temperature is low.

■If difference is distinct; please check engine oil passage and oil pump for engine oil leakage

⑥After inspections install oil pressure switch as follows:

a. Clear old sealant adhering to oil pressure switch and engine

b. To use sealant as required and tighten pressure switch

■Please use appointed sealant: A New 1243 threads sealant or its equivalent.

■Tightening torque: 8-12N.m

c. After warming up engine, make sure there is no leakage of engine oil when engine is running normally.

2, Change engine oil:

Note:

■Be careful not being burnt, as engine oil may be very hot

■Avoid long-time direct skin contact with used engine oil

If skin contact happened, you should wash thoroughly with soap or cleanser as soon as possible.

①Warm up the engine, and check for oil leakage from engine compartment please refer to “The leakage of Engine Oil"

②Shut off engine and wait for 10 Mins.

③Open engine oil filler cap, and then remove the oil draining bolt.

④Drain the engine oil

⑤Install oil draining bolts with new gasket

Note:

■Be sure to clean draining bolts and install with new gasket

■The tighten torque for draining bolts: 34 ~ 44 N M.

⑥Fill with new engine oil.

The specifications and viscosity of engine please refer to "Maintenance".

■The oil quantity: 4.5 L

Note:

■When filling engine oil, do not pull out oil dipstick.

■The refill capacity depends on the engine oil temperature and draining time, above is only for reference.

■Always use oil dipstick to check for proper engine oil refill capacity.

⑦Warm up the engine and check the area around draining bolts and oil filter for engine oil leakage.

⑧Shut off engine and wait for 10 Min.

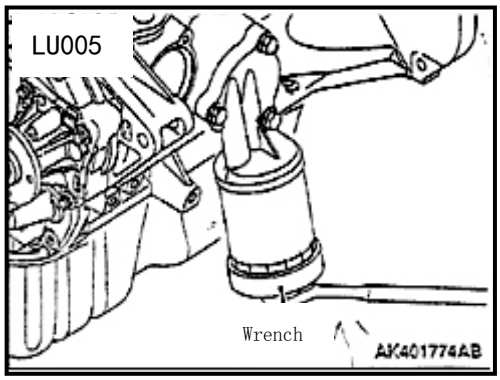
⑨Check engine oil level please refer to “The level of Engine Oil"

Oil Filter

1, Removal and installation:

1) Removal

Using oil filter wrench to remove oil filter



Note:

■Use the original oil filter provided JAC vehicles or its equivalent.

■Be careful not is being burnt, for engine and engine oil may be very hot.

■When removing, prepare a shop cloth to absorb any engine oil leakage or spillage.

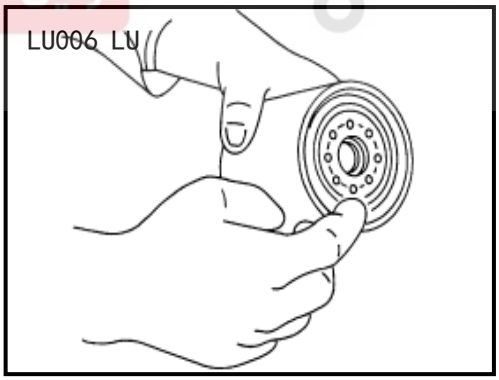
■Please do not let engine oil adhere to driving belts.

■Completely wipe off any engine oil that spills onto engine and vehicle.

2) Installation.

①Remove foreign materials adhering to oil filter.

②Smear just enough engine oil to the oil seal surface of new oil filter.



③Tighten oil filter until O-ring is seated on mounting surface, and then screw oil filter for another turn to make the tighten torque within 10-12N m.

Note:

■Oil filter must be tightened with oil filter wrench.

■Hand-tightened filter will result in oil leakage due to insufficient tightening torque.

2, Inspection after installation:

1) Check the engine oil level. Please refer to"Engine Oil"

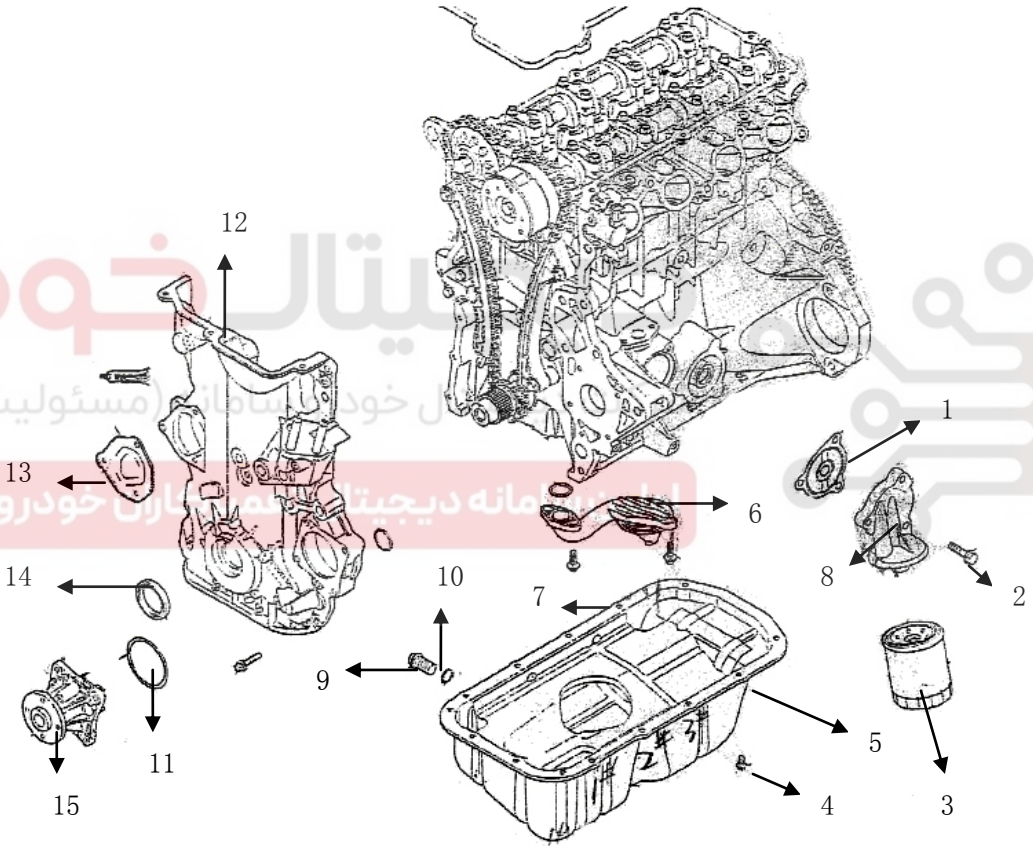
2) Start the engine, and check whether there is engine oil leakage or not.

3) Shut off engine and wait for 10 Min.

4) Check the engine oil level, and fill with engine oil. Please refer to"Engine Oil"

Oil Sump and Oil Pump

1, Component



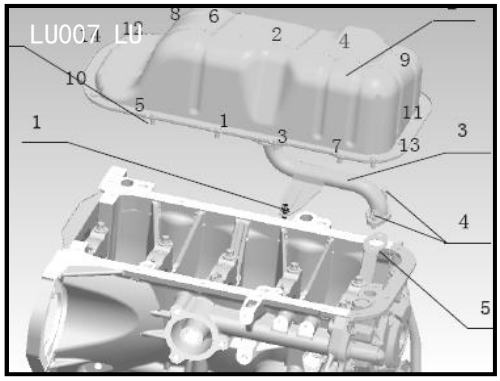
Exploded view of Oil Sump and Oil Pump

1 - Engine Oil Filter support pad 2 - Oil filter support bolts 3 - Oil Filter 4 - oil sump bolts 5 - Oil Sump 6 - Oil strainer 7 - Oil Strainer bolts 8 - Oil strainer support 9 - Oil Drain bolt 10 - Oil Drain bolt pad 11 - water pump pad 12 - oil pump assembly 13 - Automatic Tensioner cover 14 - Front Oil Seal 15 - water pump

2, Removal

Warning:

■Do not drain engine oil when engine is hot, in case of being burnt.



1) Drain the engine oil Please refer to" Changing Engine Oil"

2) Removing oil sump

a. Following the order that medium first then two sides to loosen the bolt.

■Tightening torque: 7-8.2N.m

b. As shown in the1.2.007 figure, between the oil sump and cylinder block Insert special tools.

c. Tap the side of special tools to move the tools along the sealing surface of oil sump and cylinder block, and then remove Oil sump

Caution:

■Be careful not to damage the mating surfaces.

3) Remove oil strainer.

Note:

■Do not drop pads.

■Tightening torque: 12-16N.m

4) Remove oil pump housing.

■Tightening torque: 12-15N.m

5), Remove mounting bolts on oil pump housing, and take away oil pump cover and gear.

6) Remove crankshaft front oil seal, pressure reducing valve and oil filter from the pump housing,

3, Inspection after removal

1), Oil strainer

■Clean any materials adhering to oil strainer

2), Oil pumps housing.

■Check whether the holes of oil pump housing are clogged or not, if yes, please clean it.

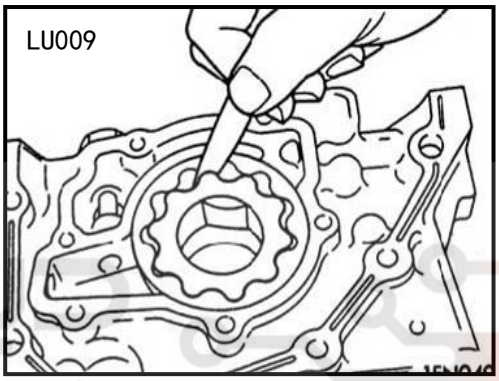
■Check oil pumps housing for cracks and other damage. If any, please replace.

3), Oil pump

Note:

■To check the clearance among oil pumps, if it is not within required range, please replace it.

■Before check please put the rotor into Front Cover.

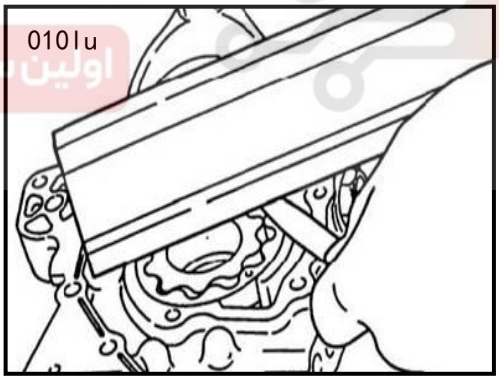


1 Check the clearance among gear tips.

Standard value: 0.06~0.18mm

2 check the side clearance.

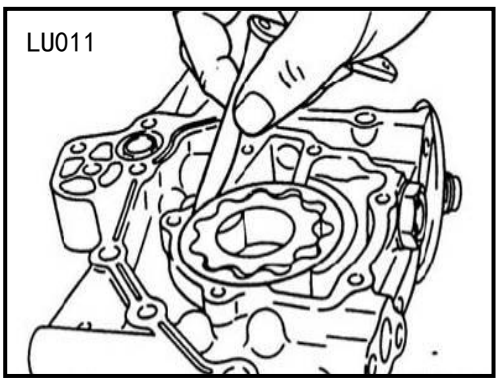
Standard value: 0.04~0.11mm



3 Check the housing clearance.

Standard value: 0.10~0.18mm

Limit value: 0.35mm

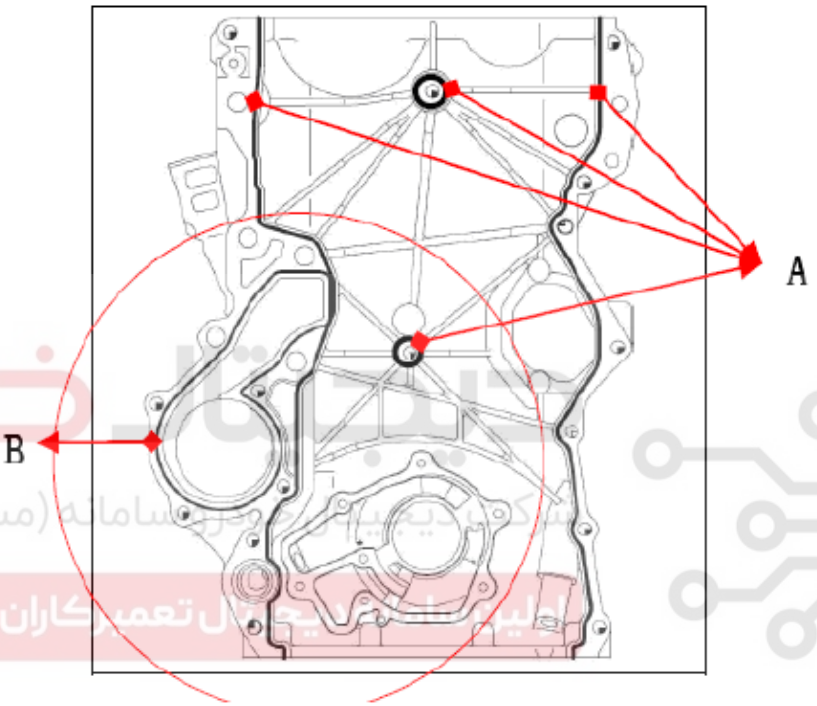


4. Installation.

1), Install oil pumps housing.

■Clean the seal surface and the front oil seal housing of cylinder block.

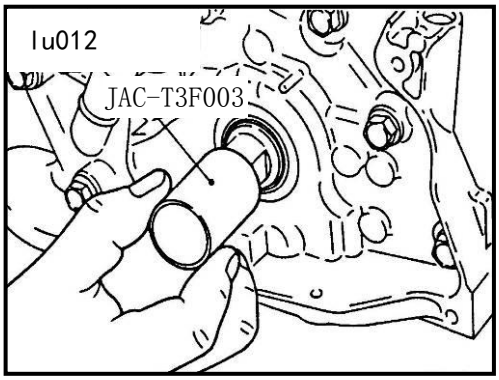
■Please refer to figure 1.2 .0 13, the diameter of adhesive at A point is 2+/-0.5 mm; the diameter of adhesive at B ponit is 1.5 + /- 0.5 mm.



■Appointed sealant: A New 1590 thread sealant or its equivalent.

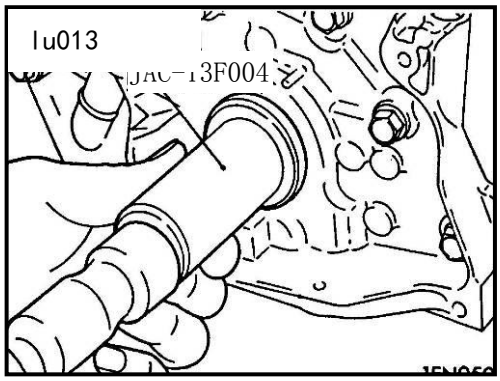
2), Install crankshaft front oil seal

■Put the special tool on front end of crankshaft and apply engine oil to its outer circumference.



■Smear engine oil onto the sealing lip, and then push oil seal in along its guide by hand, until it comes into contact with front oil seal housing

Using special tool to tap oil seal to snap into place



3) Install the pressure reducing valve assembly.

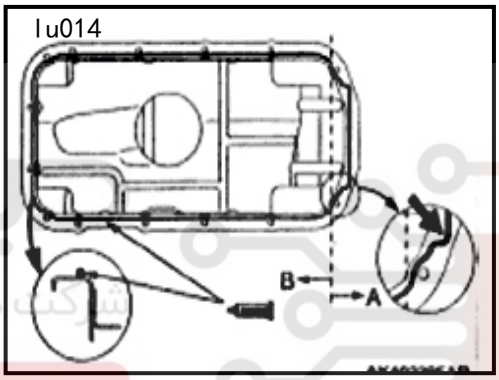
4) Install oil Filter.

■Please refer to"Oil Filter"

5) Install oil sump.

■Clean mating surfaces of cylinder block and oil sump.

■Smear 2.5+/-1mm wide edge-curled sealant around entire outer circumference of oil sump flange



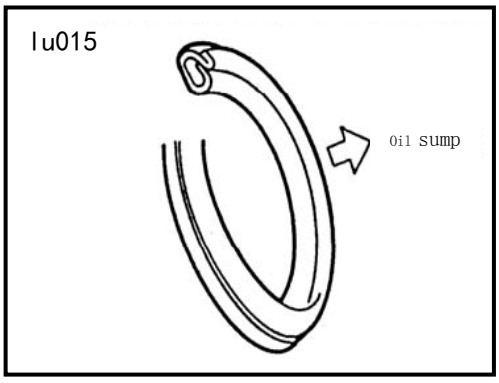
■The appointed sealant: Dow Corning 3 - 0115 flat seal or its equivalent.

6) Install oil sump draining bolt.

■Install oil sump draining bolt pad as shown.

Note:

■Fill engine oil in at least 30 Mins after the installation of oil sump



5, Inspection after installation:

1) Check the engine oil level, and fill with engine oil. Please refer to"Engine Oil".

2) Start the engine, and make sure that there is no engine oil leakage.

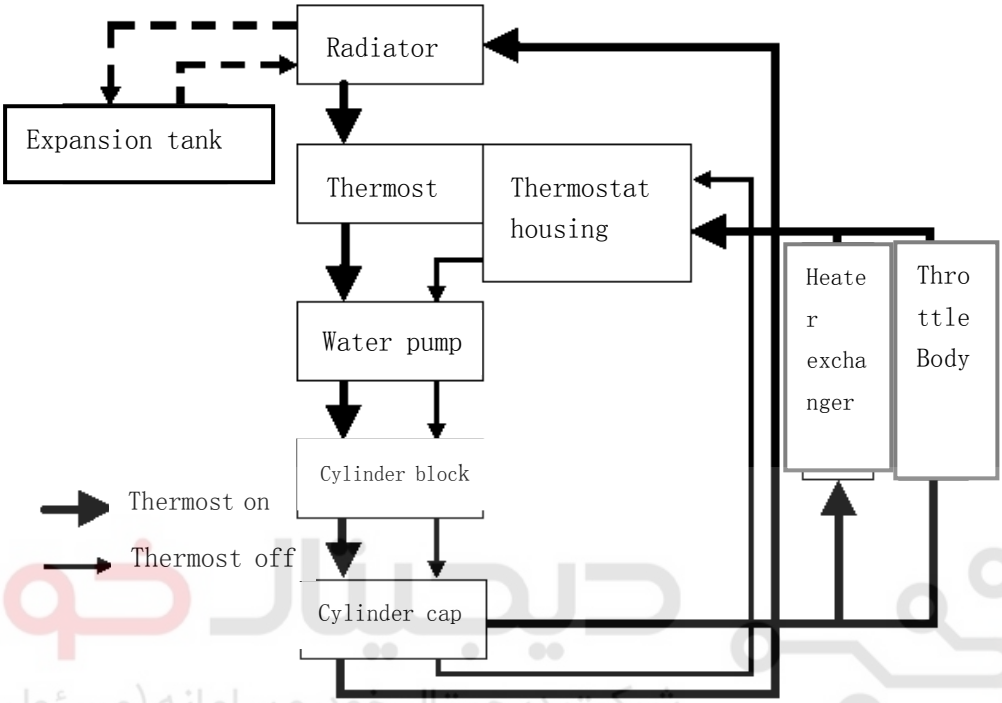
3) Shut off engine and wait for 10 Min.

4) Re-check the engine oil level. Please refer to"Engine Oil".

Cooling system

Cooling circuit

Cooling Illustrative diagram



Cooling Illustrative diagram

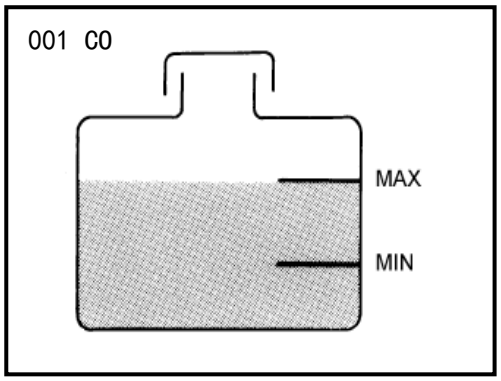
Engine Coolant

1, check

1) Level check:

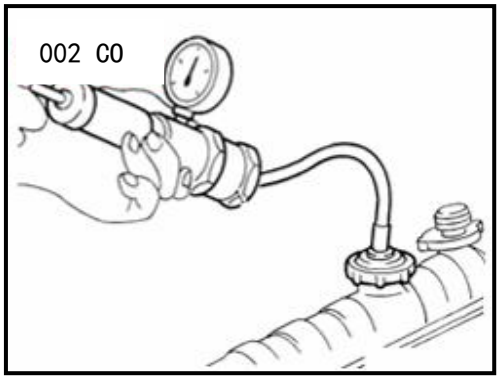
Check whether the engine coolant level of reservoir tank is within the “MIN” to “MAX” after the engine cools down.

■Adjust the engine coolant level if necessary.



2) Leakage check:

Using Radiator cap tester to check for leakage though increasing pressure to the cooling system.



3) Test pressure

Warning:

■Do not remove radiator cap when engine is hot. Otherwise serious burns could be caused by high-pressure engine coolant escaping from radiator.

Note:

■Higher testing pressure than specified may cause radiator damage.

■In a case that engine coolant decreases, please replenish radiator with engine coolant. If any part is found damaged, please repair or replace.

2, changing engine coolant

Warning:

■To avoid being scalded, please do not change engine coolant when the engine is hot.

■Wrap a thick cloth around radiator cap and carefully remove the cap. Release the pressure in radiator first. Then turn radiator cap all the way.

■Be careful not to spill engine coolant on drive belts

1), Drain engine coolant:

① Remove the right engine shroud.

② Open the drain plug at the bottom of radiator, and then open the radiator cap.

③ If necessary, please remove the coolant reservoir to drain engine coolant and clean it before re-install.

④ Check whether there is rust, debris or discoloration in the drained engine coolant,

■If contaminated, please flush the engine cooling system. Please refer to "Flushing cooling system".

2) Refilling with engine coolant:

① Install the removed reservoir tank and radiator drain plug.

Note:

■Be sure to clean drain plug and install with new O-ring

② Make sure that each soft hose clips are firmly tightened.

③ Remove the air cleaner cover and air intake hose. Please refer to" Remove air cleaner assembly".

④ Disconnect warm water outlet pipe. Please raise hose high enough.

⑤ add coolant to radiator and coolant reservoir to the required level. Fill engine coolant slowly, so as to emit the air in the system.

Note:

■Please use JAC genuine engine coolant. Please refer to"Recommended Oils and Lubricants"

■Disconnect when engine coolants overflow warm-water hose,

And then reconnect warm-water hose and continue filling engine coolant.

⑥ Install the air cleaner cover and air intake hose. Please refer to" Remove air cleaner assembly".

⑦ Install radiator cap

⑧ Warm up till the thermostat opens.

Touch the radiator down-hose and feel that whether there is a heated flow to confirm whether the thermostat opens or not.

Note:

■Check the Engine Water Temperature Gauge, avoid engine overheating.

⑨ Shut off engine to reduce the temperature

⑩ Add the engine coolant level of reservoir tank within the “MIN” to “MAX".

⑪ Install the radiator cover and repeat steps 3 to steps 9 two or more times until the engine coolant level no longer drops.

⑫ Start the engine and check cooling system for leakage.

3) Flushing cooling system:

①Install the removed radiator drain plug and reservoir tank.

Note:

■Be sure to clean drain plug and install with new O-ring

② Remove the air cleaner cover and air intake hose. Please refer to" Remove air cleaner assembly".

③ Disconnect warm water outlet pipe. Please raise hose high enough.

④Fill radiator and reservoir tank with engine coolant, and install radiator cap.

Disconnect when engine coolant overflows warm-water hose, and then reconnect warm-water hose and continue filling engine coolant.

⑤ Install the air cleaner cover and air intake hose. Please refer to" Remove air cleaner assembly".

⑥ Run engine and warm it up to normal operating temperature.

⑦ Speed engine up several times under no-load.

⑧ Shut off engine and wait for cooling down.

⑨ Drain water from the system please refer to “Draining engine coolant"

⑩ Repeat steps 1~9 until clear water begins to drain from radiator.

Radiator

1, Removal and installation:

Warning:

■Do not remove radiator cap when engine is hot. Otherwise burns could be caused by high-pressure engine coolant. Wrap a thick cloth around radiator cap and slowly turn this cap to release air pressure inside. Wait until pressure is completely released, then screw off radiator cap and take it off carefully.

1) Removal

① Remove engine shroud

②Drain engine coolant from radiator

Please refer to “Changing engine coolant”.

Note:

■Do not operate this step until engine cools.

■Please do not spill engine coolant on drive belts.

③ remove the air intake, and take it off.

④ Disconnect the harness connector of radiator fan motor, and put it aside.

⑤ remove the water inlet and outlet hoses of radiator and the water inlet hose of reservoir tank.

⑥ Remove radiator's installation support and take off radiator and radiator cooling fan component.

Note:

■When removing, please do not damage or scratch radiator core

⑦ Take off cooling fan component from radiator.

2).Installation.

Install according to the reverse order of removal.

3) Inspection after installation:

■Use radiator cap tester to check for leakage of engine coolant

Please refer to"Leakage check".

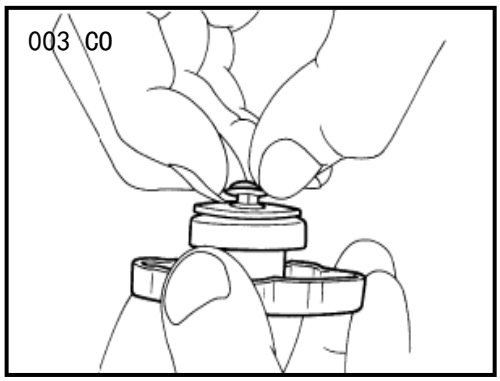
■Start the engine and warm it up. Visually check for leakage of engine coolant.

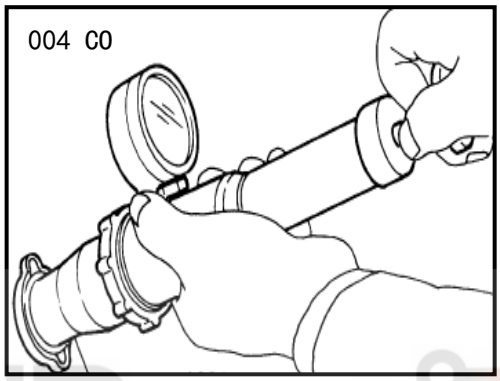
2, Check radiator cap

1) Pull out negative-pressure valve to open it. Make sure that it closes completely after pressure release.

■Make sure that there is no dirt or damage on the valve seat of radiator cap negative-pressure valve

■Make sure that there are no unusualness in the opening and closing of negative-pressure valve





2) Check radiator cap and release pressure.

Standard value: 78~98KPa

Limit: 59 KPa

Connect radiator cap to the radiator cap tester, and please smear engine coolant onto the cap seal surface.

Please replace radiator cap if negative-pressure valve operates abnormally or relief pressure drops to below the limit.

3, Check radiator

■Check radiator for mud or clogging

If necessary, please clean radiator surface as follows.

■Be careful not to bend or damage radiator fans

■If the radiator needs to be cleaned without removal, please remove all surrounding parts such as cooling fan, cowl and horns. Then tape harness connectors to prevent water from entering.

1) To flush the back side of the radiator core vertically downward by water hose.

2) To flush all radiator core surfaces per minute.

3) Stop flushing when no dirt flows out from radiator.

4) Blow the back side of radiator core vertically downward by compressed air. Use compressed air which is lower than 490 KPa and keep distance more than 30cm.

5) Blow all the radiator core surfaces per minute with compressed aird, until no water sprays out.

Radiator Cooling Fan

1, Removal and installation:

1) Removal

①Remove the air intake hose, and take it off.

②Disconnect the harness connector of radiat‹ r fan motor, and put it aside.

③ Remove cooling fan component from radiator.

Note:

■When removing, please do not damage or scratch radiator core

2) Installation.

Install according to the reverse order of removal.

2, Disassembly and Reassembly

1) Disassembly

① Remove the cooling fan from fan motor.

② Remove the fan motor from shroud.

2) Inspection after disassembly

① Cooling Fan

Check cooling fan for cracks or unusual bend. If any is found, please replace cooling fan.

② Fan motor

Check the motor for seizure.

3) Assembly

Assemble according to the reverse order of disassembly.

Water Pump

1, Removal and installation:

Note:

■When removing water pump, be careful not to get engine coolant on drive belts

■Water pump cannot be disassembled and should be replaced as a unit.

■After installing water pump, connect hose and secure with clamp, then check for leakage by radiator cap tester

1) Removal

① Drain engine coolant from radiator

Please refer to “Changing engine coolant”.

② Loosen the mounting bolts of tensioner nut.

③ Remove drive belts

Please refer to “Drive belts".

④ Remove the mounting bolts of water pump

Note:

■Please distinguish the position of mounting bolts.

■Tightening torque: 12-15N.m

2), Inspection after removal

■Check the water pump assembly for serious corrosion, water-seal leakage or corrosion.

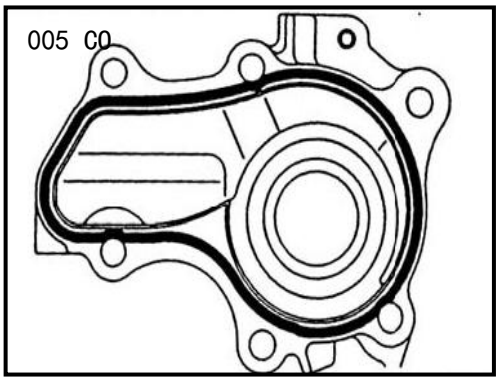
■Check for excessive play which will result in malfunction

■Check the water pump bearing for seizure or other damage. If necessary, please replace.

3) Installation.

① Clean the sealant on water pump mount and the water pump side hose.

② Install the new O-ring on the side hose of water pump.



Note: Smear engine coolant onto O-ring.

③ Smear 3 mm wide edge-curled sealant onto the surface of installed water Pump

■Appointed sealant LT5699 or its equivalent

④ Install water pump

Note:

■When install, please do not drop pad.

■Tighten the mounting bolts into water pump alternately and evenly.

a) Install water pump tensioner nut.

b) Install the drive belt, and adjust to required tension. Please refer to"Drive belts".

c) Fill with engine coolant Please refer to"Refilling with engine coolant".

2, Inspection after installation:

■Use radiator cap tester to check for leakage of engine coolant

Please refer to"Leakage check".

■Start the engine and warm it up. Visually check for leakage of engine coolant.

Thermostat Components

1, Removal and installation:

1) Removal

① Drain engine coolant from drain plug of radiator.

Please refer to “Changing engine coolant”.

Note:

■Do not operate this step until engine cools.

■Please do not spill engine coolant on drive belts.

② Disconnect the water inlet and outlet pipes and minor cycle water pipe of radiator at thermostat housing side

③ Disconnect harness connectors of coolant temperature sensor and coolant temperature warning switch and bolts securing mounts of harness connectors of front and rear oxygen sensors, and move them away.

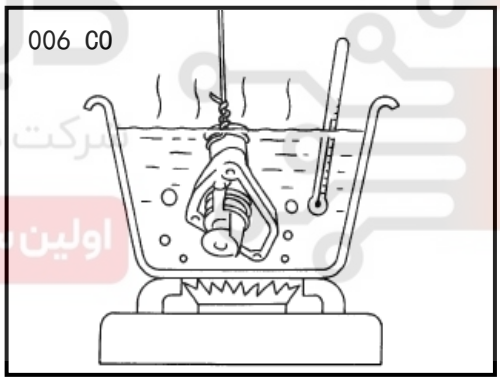
④ Remove mounting bolts Heater's water-return pipe and remove warm air return pipe.

⑤ Remove mounting bolts on thermostat upper cover, and take out thermostat.

2) Inspection after removal:

① Thermostat

■Check thermostat valve-opening condition under normal room temperature



Thermostat Opening Temperature：

82°C （begin to open）

95° C (Completely open)

The maximum lift of valve stem: ≥ 8mm

Thermostat closing temperature: > 77° C

If the massured value is outside the specified range, please replace thermostat.

② Thermostat upper cover and Thermostat housing

Check for cracks and other damage.

3) Installation.

Please note the following items and install in the reverse order of removal.

① Be careful not to spill engine coolant on drive belts. Use rag to absorb engine coolant.

② Replace the water pipes' O-ring with a new one, and then smear coolant onto the O-ring, so that they can be easily embedded in the water-pump thermostat

housing.

Note:

■Never smear the O-ring with engine oil or other oil material.

■The pipes at the back of thermostat housing must be installed firmly.

If engine coolant temperature sensor needs to be reused,

Please smear the thread with appointed sealant.

■The appointed sealant: LT648 or equivalent

2, Inspection after installation:

■Use radiator cap tester to check for leakage of engine coolant

Please refer to"Leakage check".

■Start the engine and warm it up. Visually check for leakage of engine coolant.

Water Pipe components

1, Removal

① Drain engine coolant from drain plug at the bottom of radiator. Please refer to "Changing engine coolant".

Note:

■Do not operate this step until engine cools.

② remove air cleaner assembly

Please refer to" Remove air cleaner assembly".

③ Remove the water hose of radiator.

④ Remove warm-water hose and minor cycle water pipe.

⑤ Remove mounting bolts of inlet water pipe, and then remove the water inlet pipe from the back of water pump.

Note:

■Before removing, please remove the battery negative terminals.

2. Installation.

Please note the following items and install in the reverse order of removal.

1) Firmly install each pipe. Install the clamp and make sure that clamp will not

hold the bump of water pipes.

2) Replace the water pipes' O-ring with a new one, and then smear coolant onto the O-ring, so that they can be easily embedded in the water-pump thermostat housing.

Note:

■Never smear the O-ring with engine oil or other oil material.

■The pipes at the back of thermostat housing and water pump must be installed firmly.

3, Inspection after installation:

1) Check for leakage of engine coolant using the radiator cap tester. Please refer to"Leakage check".

2) Start the engine and warm it up. Visually check for leakage of engine coolant.

Failure analysis

Analysis list of over-heating

<table>
<tr><th></th><th colspan="2">Symptoms</th><th colspan="2">Check items</th></tr>
<tr><td rowspan="11">Parts malfunction of cooling system</td><td rowspan="5">Poor heat radiation</td><td>Water pump malfunction</td><td>Worn or excessive loosing drive belt</td><td rowspan="5">-</td></tr>
<tr><td>Thermostat stuck at OFF position</td><td></td></tr>
<tr><td>Damaged radiator fans</td><td>Mud or paper clogging</td></tr>
<tr><td></td><td>Mechanical damage</td></tr>
<tr><td>Radiator cooling clogged</td><td>Excessive foreign materials (erosion, dirt, sand, etc.)</td></tr>
<tr><td rowspan="3">Inadequate air flow</td><td>Cooling fan does not operate.</td><td rowspan="3">Fan assembly</td><td rowspan="3">-</td></tr>
<tr><td>Excessive resistance to fan rotation</td></tr>
<tr><td>Damaged fan blades</td></tr>
<tr><td>Shroud damage</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Improper coolant mixture ratio</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Poor engine coolant quality</td><td>-</td><td>Viscous engine coolant</td><td></td></tr>
<tr><td rowspan="2">Insufficient engine coolant</td><td rowspan="2">Engine coolant leakage</td><td rowspan="2">Coolant hose</td><td>Clamps loosen</td></tr>
<tr><td>Cracked hose</td></tr>
</table>

			Water Pump	Poor sealing effect
			Radiator cap	Loosened
				Poor sealing effect
			Radiator	O-ring for damage, aging or improper installing
				Radiator water tank Cracked
				Radiator core cracks
			Reservoir tank	Reservoir tank breaks
		Overflowing reservoir tank	Exhaust gas leaks into cooling system.	Cylinder head aging
				Cylinder head pad aging
In addition	-	Engine overloads	Drive improperly	Engine rpm is excessive when unloaded
				Drive for extended time
				Drive at extremely high speed
Malfunctions of parts out of cooling system			Powertrain system malfunction	
			Installed with wheels and tires of improper sizes	
			Retardant brakes	
			Incorrect ignition timing	
	Blocked air flow	Blocked bumper vent	-	-
		Blocked radiator grille	Installed car hood	
			Mud or paper clogging	
		Clogged radiator	-	
		Blocked condenser	Blocked air flow	

Service Parameters

Specifications table of cooling system

Thermostat Opening Temperature	82°C（begin to open） 95°C（completely）
Thermostat closing temperature	≥77°C
The maximum lift of valve stem	>8mm

Fuel Supply System

Precautions

Warning:

When replacing or removing fuel system parts, be sure to observe the following tips.

■Put a “NO FIRE” signs in the operation position.

■Be sure to work in a well ventilated area and equip operation position with CO2 fire extinguishers.

■Be sure to put drained fuel into a container and well-caped

Keep the container in safe area.

■When removing fuel line parts please operate the following procedures:

Release fuel pressure inside the fuel pipelines.

Disconnect the negative cable of battery.

■Please do not twist fuel pipes when install.

■Please operate at a flat place.

■After connecting fuel pipes connectors, make sure they are connected firmly. Ensure that connector and resin tube not touch with any adjacent parts.

■Please do not tighten hose clamps excessively to avoid damaging hoses.

■After installing fuel pipes please make sure there are no fuel leakage at all junctions by operating the following steps.

Increase fuel pressure to fuel lines by turning ignition switch “ON”. (Do not start engine!)

Then check for fuel leakage at junctions.

Start engine and rev it up and check for fuel leakage at junctions.

■Please get a container and rag ready in advance as fuel may leak.

■Avoid open flames and sparks

■Please keep removed parts away from any fire source.

■Be sure to keep junctions clean and avoid damage and entry of foreign material Please cover them completely with plastic bags or similar articles

.

■Please use genuine fuel system spare parts provided by JAC.

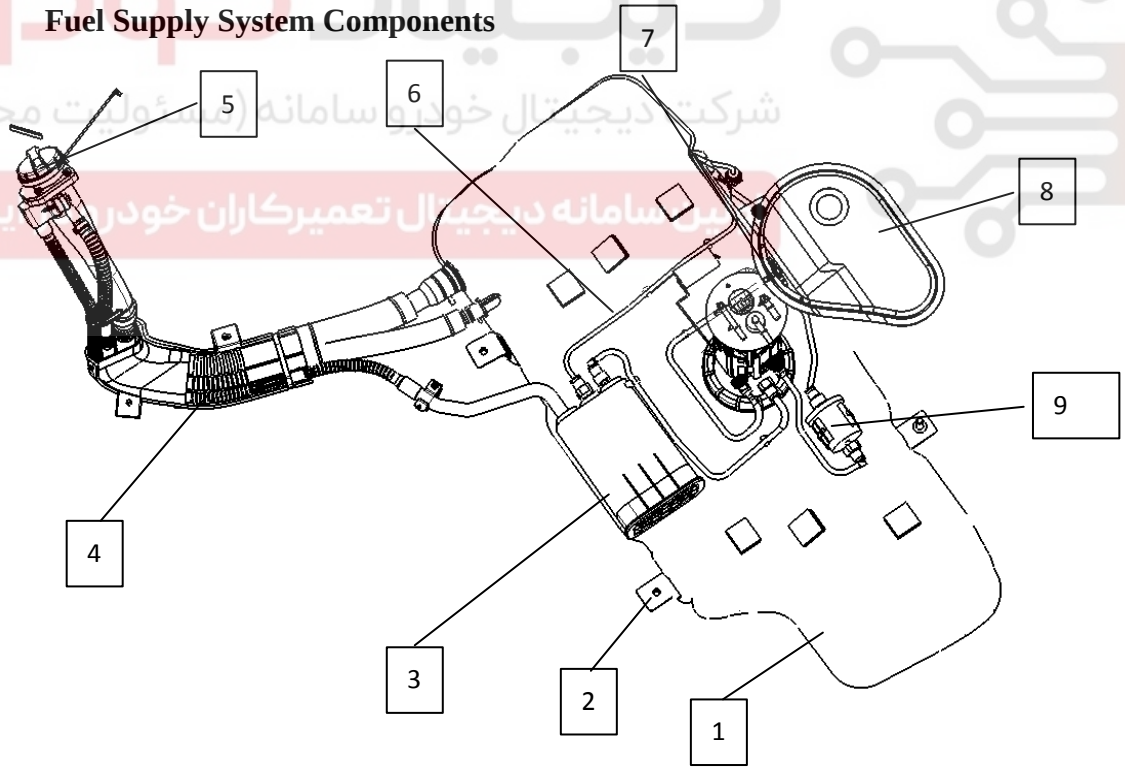
Preparations

Special tools:

List of Special Tools

SN	Tool	Outline drawings	Number	Descriptions
1	Fuel pressure gauge		JAC-T1F018	Measure fuel pressure

Fuel Supply System Components



Fuel System Assembly Drawing

1.Fuel tank assembly 2.Fuel tank band 3.Canister assembly 4.fuel filler pipe assembly 5.fuel filler cap 6.Fuel supply line 7.Fuel transfer pump assembly 8.Fuel pump access cover 9. Fuel filter

Fuel Tank

1, Removal

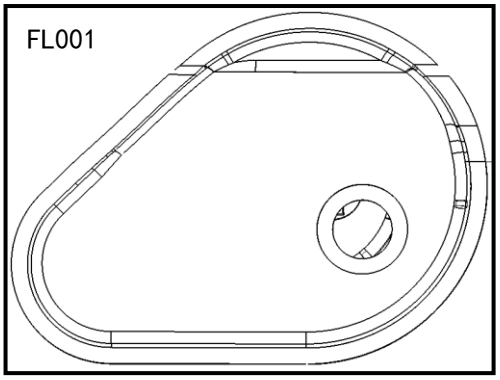
1) Release left fuel pressure inside the fuel pipelines.

2) Open fuel filler cap to release the pressure in fuel tank.

3) Remove rear seat.

4) Remove fuel tank service-cover.

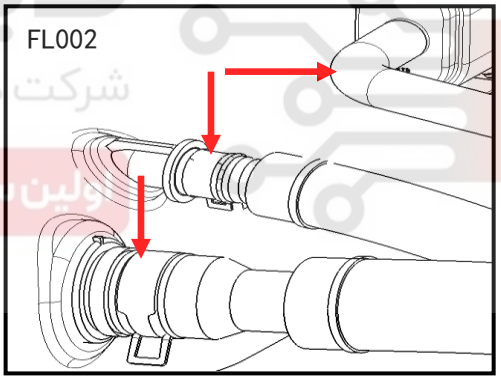
■Pry off with a flat screwdriver directly



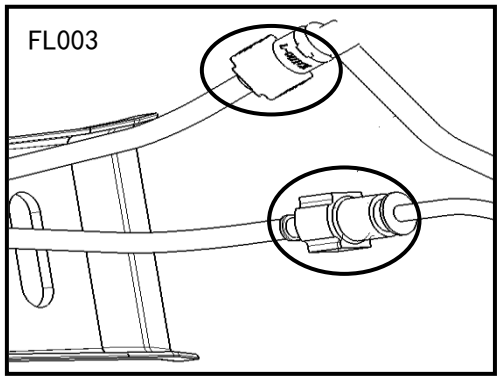
5) Disconnect the harness connector on the fuel pump.

6) Remove the sub-frame assembly.

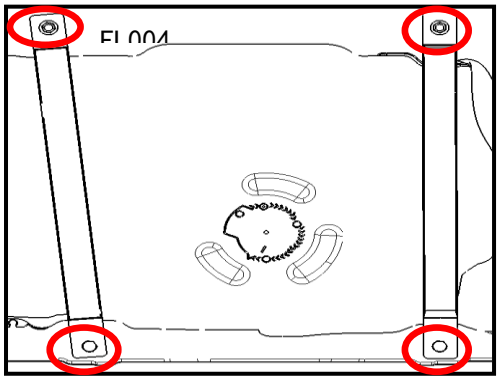
7) Disconnect the connections of fuel lines, fuel tank and canister.



8) Disconnect the pipe on fuel tank and the pipe installed under the protection cover.



9) Support the fuel tank with bracket mount, remove mounting bolts and nuts of fuel tank strap so as to remove the fuel tank strap.



Note:

■The support points should not intervene the fuel tank strap

10) Take off the fuel tank, if necessary; take the needed parts and components from it.

2, Inspection after removal:

■Check the surface of fuel tank assembly for scratch or serious distortion

3, Installation

Install according to the reverse order of removal.

■When install the fuel tank strap, the tighten torque of bolt and lock nut is from 40 N. m ~50 N. m.

4) Inspection after installation

Check for fuel leakage according to the following procedure.

Turn ignition switch to “ON” position (do not start engine), and check the junctions of fuel pipes for leakage.

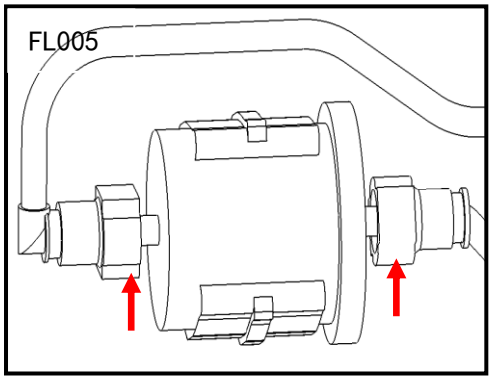
Start engine and rev it up, to confirm there is no leakage at junctions of fuel system hose and pipes.

Fuel Filter

1, Removal

Note:

■Fuel filter should be replaced regularly according to the maintenance guide in the “Operation Manual”.



1) Remove fuel tank assembly; please see detailed procedure"Fuel Tank

Removal".

2) Disconnect the fast plug between fuel pipes and fuel filter.

Note:

■Wrap fuel filters with a towel or similar article to avoid ejection of fuel caused by residual pressure.

3) Pull out the fuel filter from the filter mounting bracket along the line direction on the surface of fuel tank.

2, Inspection after removal:

■Check filter assembly surface for scratch or serious distortion.

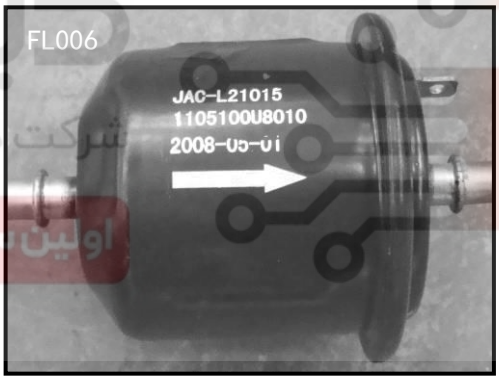
3, Installation

Please note the following and install according to the reverse order of removal.

1) Fuel filter

■Pay attention to installation direction of fuel filter

⇨ Toward the fuel outlet line



2) Connect the fast plug connector

Connect fuel pipe connector as followed:

Check the junctions for foreign materials or damage.

Align the connector with resin tube at the two end of filter, and then insert the connector straight into the tube until a click sound is heard.

4) Inspection after installation

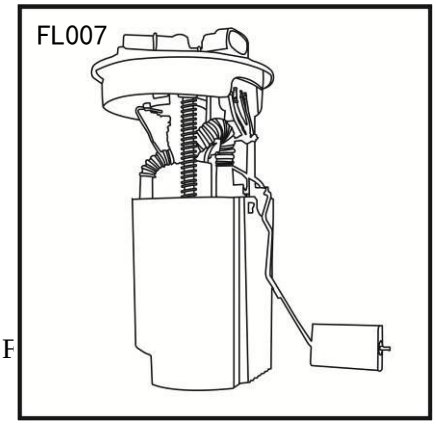
After installation, check for fuel leakage according to the following procedure.

Turn ignition switch “ON” (with engine stopped) after lifting the vehicle to a certain height, and then check fuel filter line junctions for leakage.

Start engine and run it at idle speed and high speed, and make sure again there

are no fuel leakages at the fuel filter junctions.

Fuel Pump Assembly



F

1, Removal

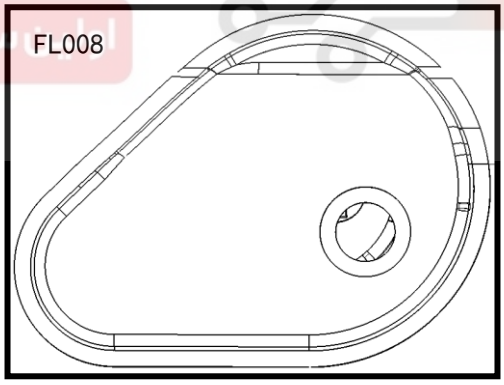
Warning:

■Be sure to read the "General Considerations"

1) Check the readings on fuel gauge. If fuel gauge indicates a “FULL” or close to “FULL” position, then drain the fuel in fuel tank until the level indicated by fuel gauge is below “E”.

2) Release fuel pressure in the fuel pipelines.

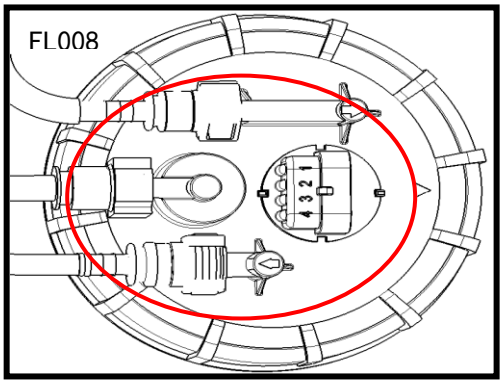
3) Open fuel filler cap to release the pressure in fuel tank.



4) Remove rear seat cushion.

5) Remove fuel tank service-cover.

■Pry off with a flat screwdriver directly



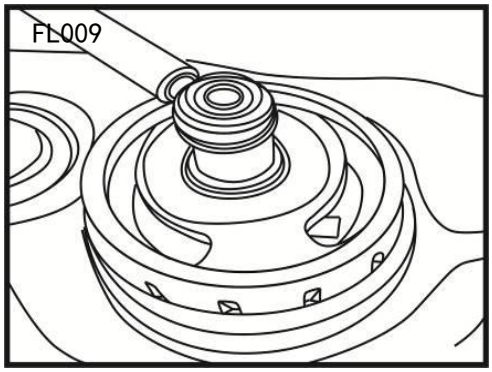
6) Disconnect the fuel pump harness connector and fuel lines connector.

Note:

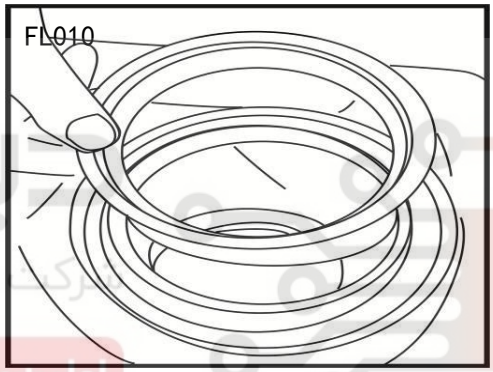
■Do not use any tools to disconnect connector.

■Keep junctions clean and avoid damage and entry of foreign material. Please cover them completely with plastic bags or similar articles.

7) Using special lock nut retainer to loosen lock nut and take it off.



8) Remove Y-ring seal.

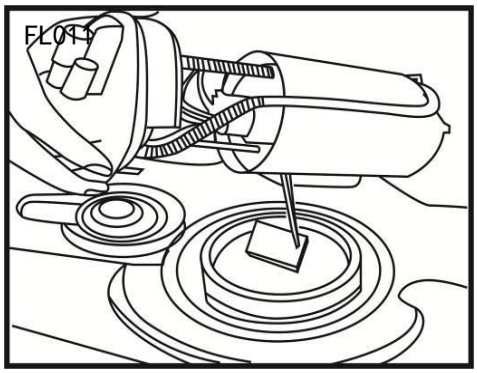


9) Pull out fuel pump.

Note:

■When pulling it out, tilt fuel pump to avoid damage to fuel level sensor.

■To avoid contamination with residual fuel, please wrap the fuel pump with rag and pull it out straightly.



2, Inspection after removal

1) Fuel pump:

■Check for breakage and impurities in fuel

If any, please replace or clean.

■Resistance check

Measure the resistance between 2 terminals of fuel pump. Its value should be approx. 2~30Ω.

■Fuel supply pressure check. Connect a 12V power source and test it while running in gasoline.Observe whether fuel is output from delivery pipe of fuel pump, check whether fuel supply pressure can be built up.

■Please do not run it for extended time so as to avoid damage to pump core.

2) Y-ring seal

■Check for starving and breakage

3) Lock nut

■Check for deformation, cracks, starving, breakage, and mounting thread damage.

4) Fuel level sensor

■Check fuels float for interference and check its surface for oxidation.

3, Installation

Please note the following and install according to the reverse order of removal.

1) Fuel Pump Assembly

■When install, make sure the Y- ring match with the fuel tank completely.

■The fuel pump should be tilted into, and please note the installation direction of fuel pump assembly.

■When install fuel pump, make sure that the Y-ring is not edged.

■Pre-tighten the lock nut then install, then install the horizontal lock, the tighten torque is 75 N. m±5 N. m

2) Fast plug connector

① Check the junctions for foreign materials or damage.

② Align the connector with resin tube, and then insert the connector straight into the tube until a click sound is heard.

③ After connecting, make sure that the connection is secure by following

method.

■Pull the resin tube and the connector heavily to confirm that they are ecurely connected.

4) Inspection after installation

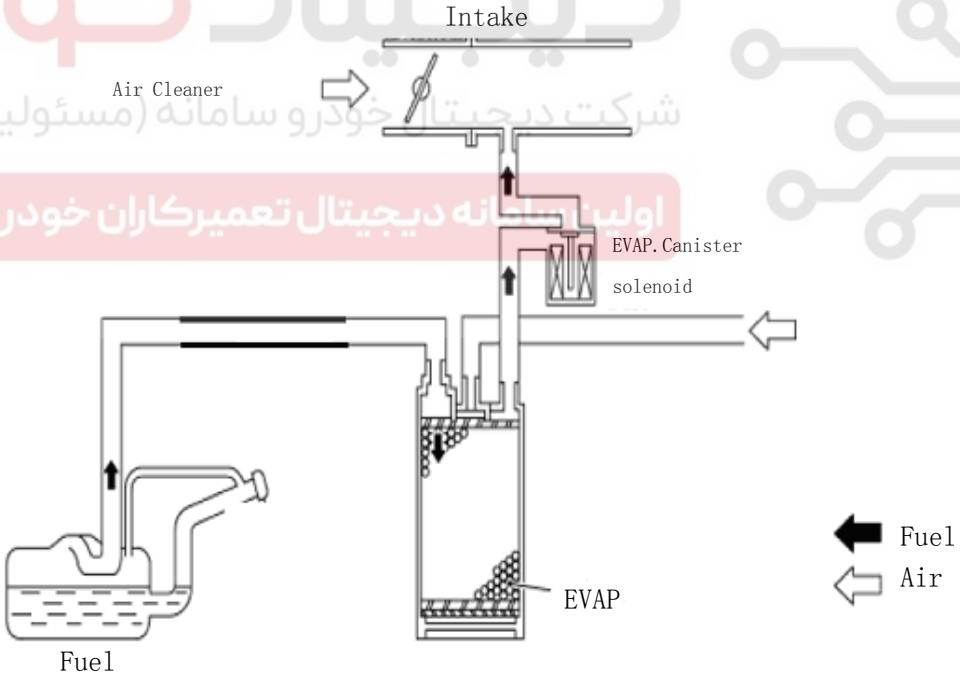
Check for fuel leakage according to the following procedure.

1) Turn ignition switch to “ON” position (do not start engine), and check the junctions of fuel pipes for leakage.

Start engine and rev it up, and re-confirm that whether there is leakage at connections of fuel system or not.

Fuel Evaporative Emission Control System

System description:



Fuel Evaporative System Illustrative Diagram

① The fuel evaporative system is used to reduce the hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished effectively by applying activated charcoals in the canister.

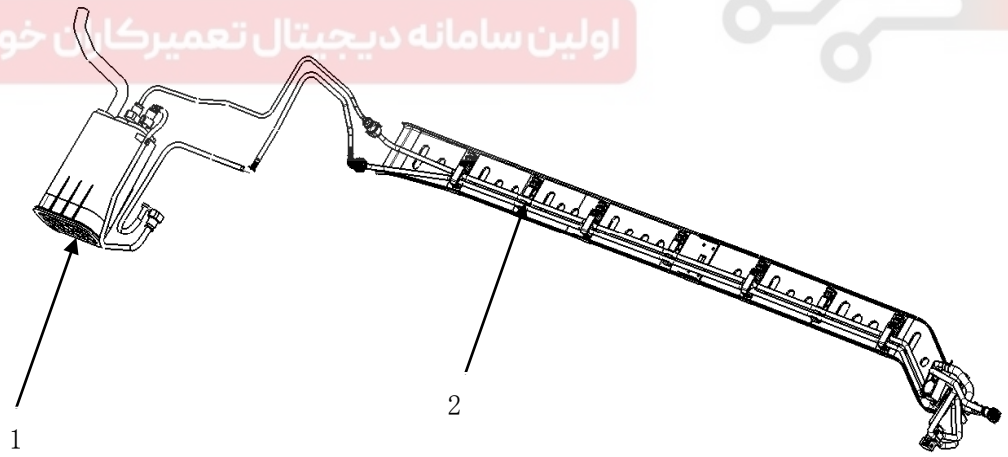
② The fuel vapor evaporated from the sealed fuel tank is led into the canister which contains activated carbon and stored there, when the engine is not operating or when refueling to the fuel tank.

③ The fuel vapor in the canister is routed into the intake manifold through purge pipelines when the engine is operating. Canister purge volume control solenoid valve is controlled by ECU. When the engine operates, the flow rate of vapor controlled by canister purge volume control solenoid valve is proportionally regulated as the air flow increases.

④ Canister purge volume control solenoid valve also shuts off the vapor purge pipes during decelerating and idling.

⑤ Riveted on fuel tank, fuel vapor control valve can prevent fuel vapor from being excessively emitted into canister.

2, Fuel evaporative emission pipeline drawings



1. Canister Assembly 2, Fuel pipeline Assembly

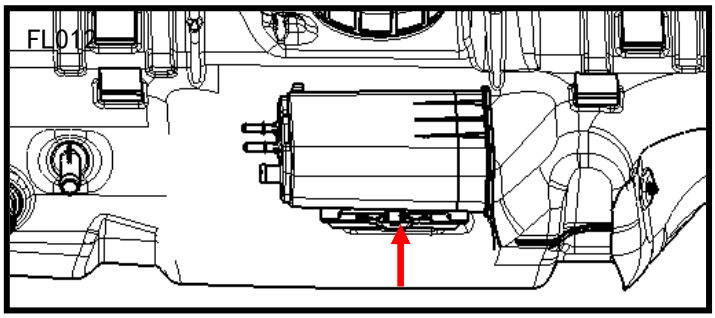
Note:

■Please do not use soapy water or any type of cleanser while installing vacuum hose or purge pipelines.

3, Components inspection:

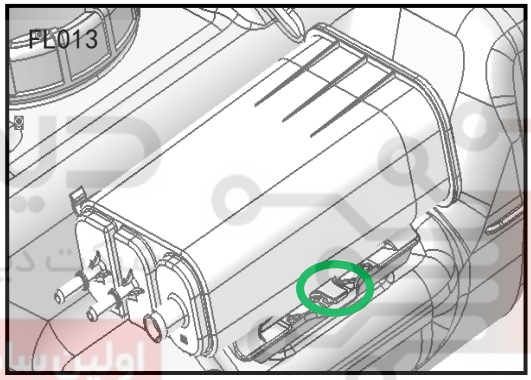
1) Canister:

① The location of canister: Located on the mounting suuport of the canister on fuel tank.



② canister removal

1) Release left fuel pressure inside the fuel pipelines.



2) Open fuel filler cap to release the pressure in fuel tank.

3) Disconnect the connection of the pipelines in connector box on canister.

4) Pull upward the holder of the support of canister.

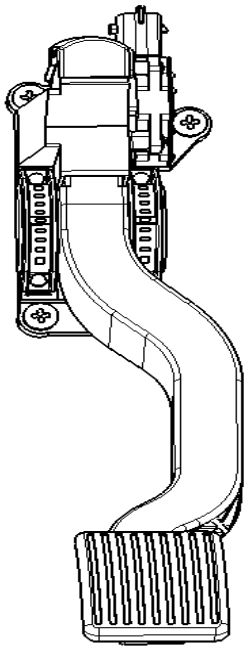
Pull out the canister from installing support.

5) Fuel filler cap

The fuel filler cap is provided with a vacuum relief valve. When pressure in fuel tank is high (much fuel vapor), the vacuum reducer valve will close to prevent fuel vapor from emitting into the atmosphere. When pressure in fuel tank is low (negative pressure), the vacuum reducer valve will open to allow outside air to enter fuel tank.

Accelerator Control Device

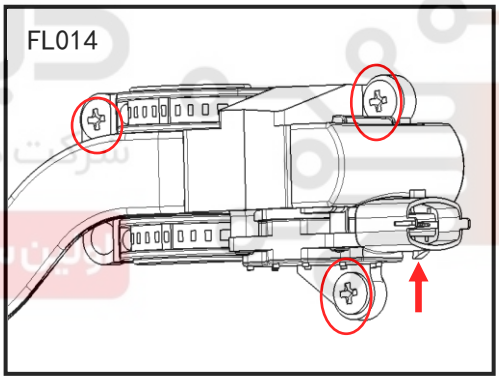
1. Components: Electronic accelerator pedal



2, Removal

1) Disconnect the harness connector on electronic accelerator pedal.

2) Remove the 3 mounting screws on the pedal.



3, Inspection after removal

Check pedal for cracks and mobility of movable joint.

4, Installation

Install according to the reverse order of removal.

5, Inspection after installation:

■Check whether accelerator pedal can operate smoothly or not.

Service Data and Specifications

Specification Table of Fuel System

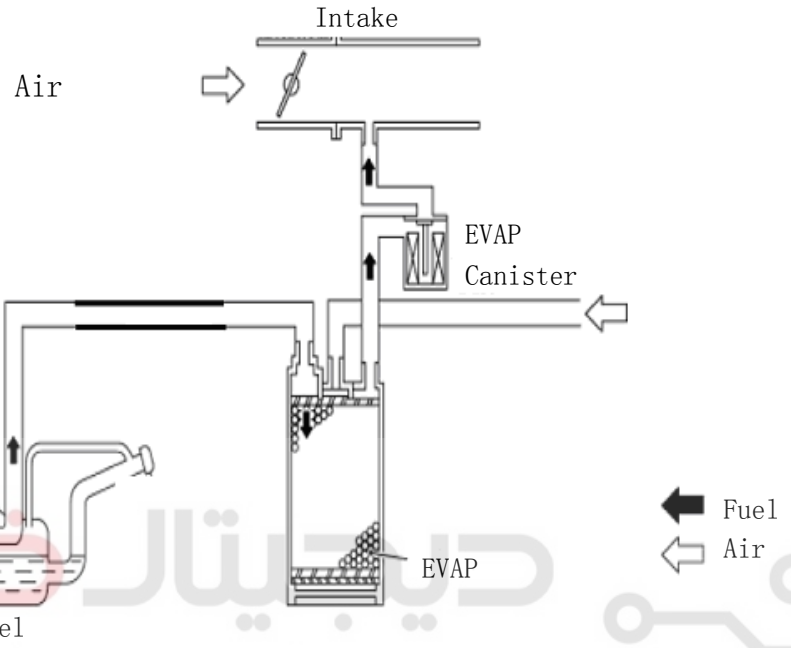
Items	Descriptions
Fuel tank capacity	45L
Fuel pump	

Working voltage	6～15 V
Rated working voltage	12 V
System pressure	350 kPa
Range of permissible operating temperature	-30℃～+70℃
Radio disturbance characteristic	Requirements of clause 6.2,6.4 in GB/18655

Emission Control System

Fuel Evaporative System

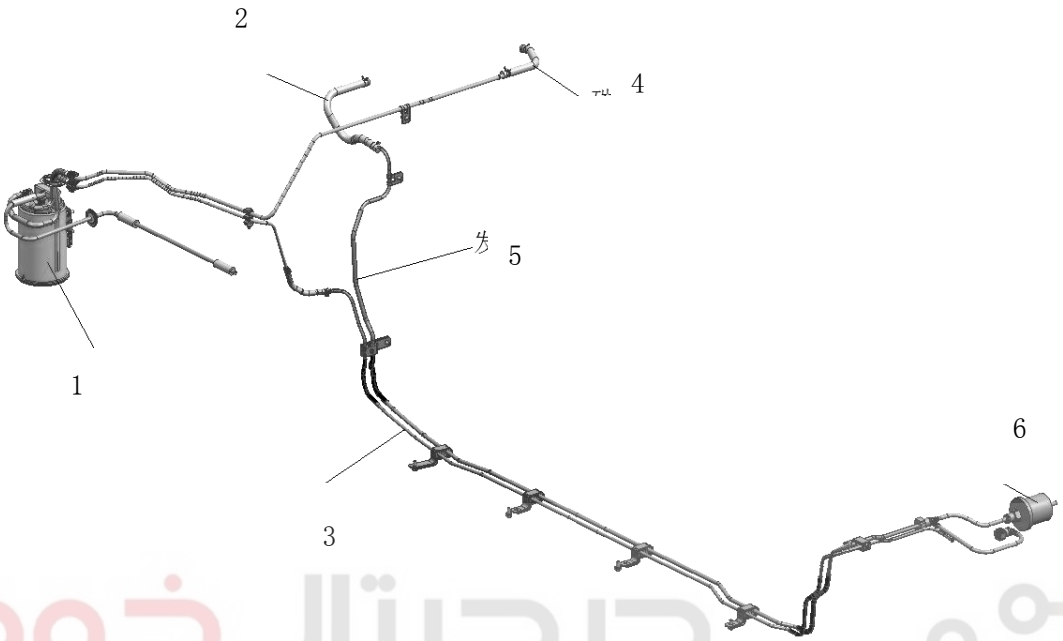
1, System description:



Fuel Evaporative System Illustrative Diagram

The fuel evaporative system is used to reduce the hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by applying activated charcoals in the canister. The fuel vapor evaporated from the sealed fuel tank is led into the canister which contains activated carbon and stored there, when the engine is not operating or when refueling to the fuel tank. The fuel vapor in the canister is routed into the intake manifold through purge pipelines when the engine is operating. EVAP Canister solenoid valve is controlled by ECU. When the engine operates, the flow rate of vapor controlled by EVAP Canister solenoid valve is proportionally regulated as the air flow increases. EVAP canister control solenoid valve will shut off the vapor purge pipes during decelerating and idling.

2,Fuel evaporative emission pipeline drawings



Fuel Evaporative System Line Drawing

1- Canister Assembly2 - Engine Oil Inlet Hose 3 - Canister to solenoid valve hose
4- Canister to solenoid valve hose 5 - Engine Oil Tube 6 - Fuel Filter

Note:

■Please do not use soapy water or any type of cleanser while installing vacuum hose or purge pipelines.

3, Components inspection:

1) P Canister

① Check EVAP canister according to the following procedure

a. block port 1, and blow from port 3, Confirm that air flow out from port 2 smoothly.

b. block port 3, and blow from port 1,

Confirm that air flow out from port 2 smoothly.

② Vacuum hose removal

Using slip-joint pliers to loosen the clamps connecting canister to fuel tank and canister solenoid valve, and pull off vacuum hose.

③ canister removal

Lift up the canister from the left daughter board lining

Remove it from its holder.

2) EVAP Canister solenoid valve.

The changes of the openning of vapor bypass line in canister solenoid valve controls air flow rate. Canister solenoid valve repeats ON/OFF operations according to signals sent by ECM and the opening of the valve changes in order to achieve the best of engine control. The optimal values stored in ECM depend on different engine conditions. When engine is running, air flow rate of fuel vapor from canister is regulated with changes of airstream.

① Component description:

EVAP Canister solenoid valve uses ON/OFF duty cycle to control THE flow rate of fuel vapor flowing out of EVAP canister. EVAP canister solenoid valve is driven by the on/off (ON/OFF) Duty Cycle signal sent from ECM. The longer the pulse width is, the more fuel vapor flow through the valve.

② Remove

a, Disconnect EVAP canister solenoid valve vacuum hose.

b, Disconnect EVAP canister solenoid valve harness connector.

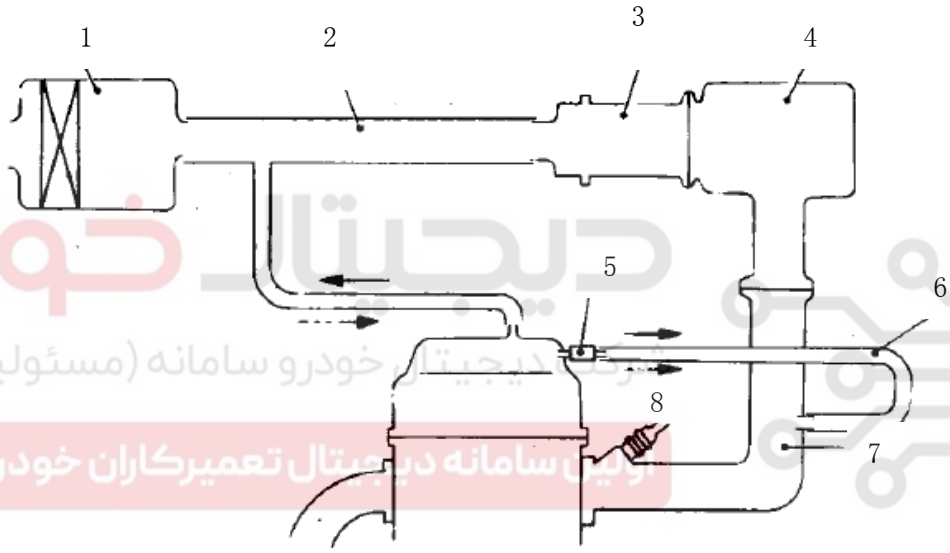
c, Take off EVAP canister solenoid valve from its holder.

3) Fuel filler cap

The fuel filler cap is provided with a vacuum relief valve. When pressure in fuel tank is high (much fuel vapor), the vacuum reducer valve will close to prevent fuel vapor from emitting into the atmosphere. When pressure in fuel tank is low (negative pressure), the vacuum reducer valve will open to allow outside air to enter fuel tank.

Positive Crankcase Ventilation Syatem

1, System description:



Positive Crankcase Ventilation System Diagram
1 - Air Cleaner 2-air intake hose 3 - throttle valve 4 - Purge tank 5-PCV valve
6 - Air Hose 7 - Air Intake Manifold 8 - Fuel Injectors

The function of Positive Crankcase Ventilation System is to make the blowby air from cylinder flow back to the intake manifold.

Crankcase Ventilation VALVE (PCV) in the crankcase makes the blow by air from cylinder in crankcase flow back to the intake manifold. With the engine TPS circuit turning on, the intake manifold can draw the blowby air in crankcase through PCV valve. Under normal circumstances, the ventilation ability of PCV valve is adequate to draw the crankcase blowby air and a small volume ventilation air. Ventilation air is drawen from the air intake hose into crankcase. In this process, air will go through the air intake hose and the hose of rocker arm cover. When TPS

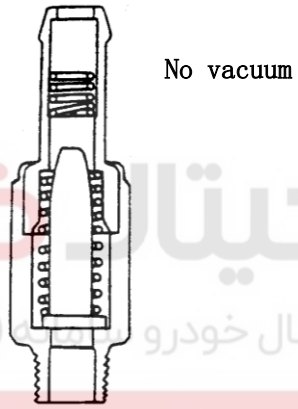
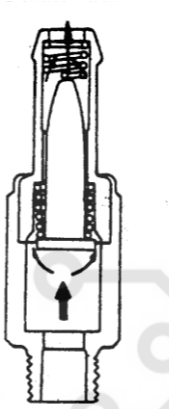
circuit fully opens, the vacuum of intake manifold is insufficient to open PCV valve and draw the blowby air in crankcase. Air will flow through hose connections in the opposite direction. PCV valve can't meet requirements if air blowby situation is very seirous. Because, in any case, there will be some gas goes through the hose and gets into the air intake hose.

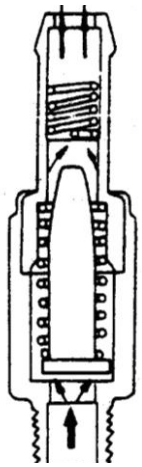
2, Components inspection:

Check Positive Crankcase Ventilation as follows:

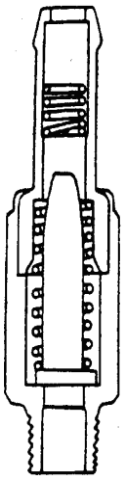
1) Operation Principle

PCV Valve Operation Principle Diagram

<table>
<tr><td colspan="2"> 
</td><td colspan="2"> 
</td></tr>
<tr><td>Engine working condition</td><td>Not running</td><td>Engine working condition</td><td>Idling or deceleration</td></tr>
<tr><td>PCV valve</td><td>Not Work</td><td>PCV valve</td><td>Fully open</td></tr>
<tr><td>Vacuum change</td><td>Limit</td><td>Vacuum change</td><td>Slight</td></tr>
</table>



Valve Chamber



Valve Chamber

Engine working condition	Working normally	Engine working condition	Acceleration and high-speed negative
PCV valve	Working normally	PCV valve	Working trady
Vacuum change	Large extent	Vacuum change	Very large

3, Removal and installation

① Removal

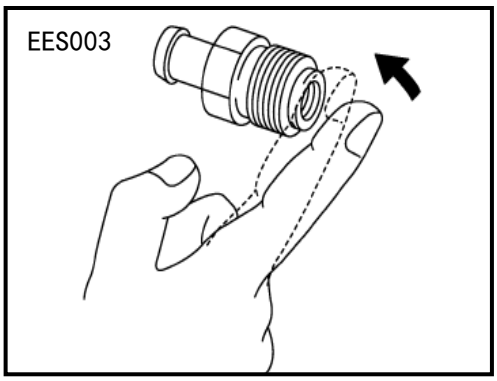
a. Disconnect PCV valve hoses and cylinder head cover.

b. Remove PCV valve from the cylinder head cover.

3), Inspection after removal

① PCV valve

When the air stream flows though, functional valve will come out with hissing noise. When put your finger on the valve inlet, you will feel a strong vacuum pressure.



② PCV valve ventilation hose

a. Check the hoses and hose connections for leakage.

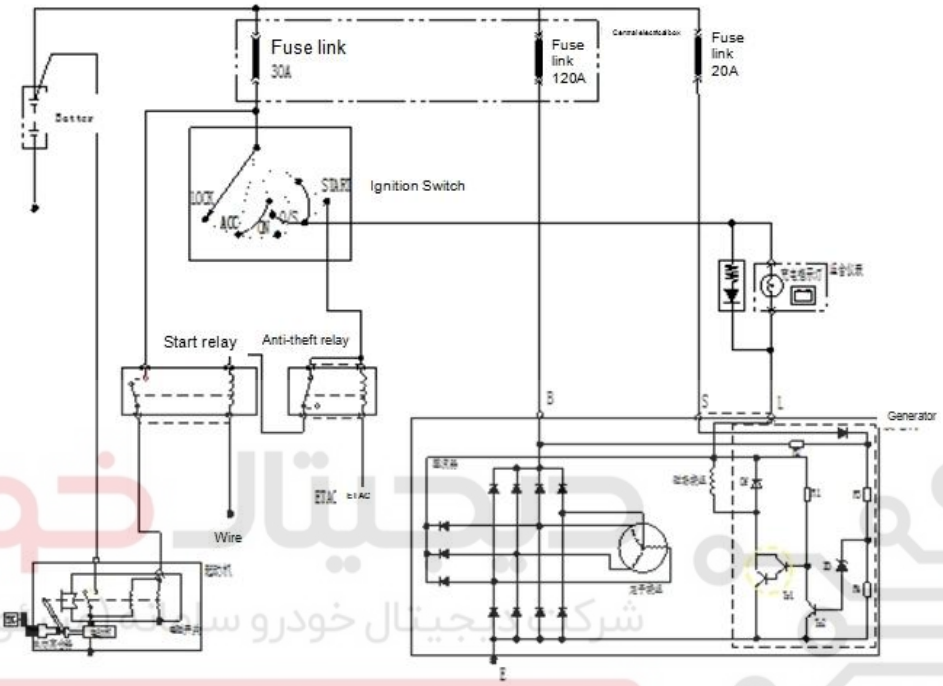
b. Disconnect all hoses and use compressed air to clean them. If you cannot

clear obstructions in the hose, please replace it.

Engine Electrical

Start charging system

Start charging system Illustrative Diagram



Start charging system Illustrative Diagram

Batter

Battery

1, How to use the battery

Note:

■If it is necessary to use auxiliary battery and cross-wire to start the engine, be sure to use 12 V auxiliary batteries.

■After connecting the battery, confirm that cross-wire is clamped to the battery terminals and good contacted.

2, Methods to prevent the battery from over-discharging

To prevent battery from over-discharging, the following precautions should be attached great importance to.

■Always keep the battery surface (especially the top) clean and dry.

■The port of the connecting part should be cleaned and tightened.

■If the vehicle is not in operation for a long period, please disconnect the negative battery terminal.

■Check the battery for charge status

3, check

1) Visually check

■Check the battery terminals for damage, fluid leakage, if any, please replace it.

2) Check voltage (U)

① If U > 13.2 V, please check the electrical system.

② If 12.5 V <U <12.9 V, It means the system is working normally.

③ If 11 V <U <12.4 V, please check the charging system.

④ If U <11 V, it means the battery is damaged or there is a problem with the charging system, please check the charging system and the battery.

4, Removal and installation

1) Removal

■Turn ignition switch to “OFF” position

① Disconnect negative terminal.

② Remove the battery positive terminal and the battery plate mounting bolts, then take out the board.

③ Remove the battery.

④ Remove the battery carrier.

2), Inspection after removal

① Battery carrier

■Check for corrosion

If any, please clean it with hot water.

② Battery harness

■Check for wear or damage

If any, please replace.

3) Installation

Install according to the reverse order of removal.

Note:

■When connecting, please connect the battery positive terminal first.

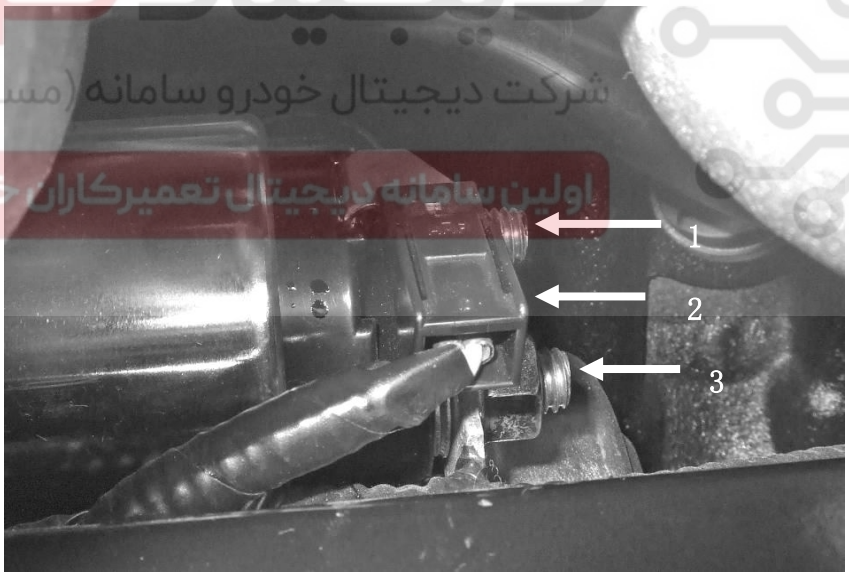
■After installation, please smear mineral oil on terminals.

Start System

1, System description:

When starter solenoid switch is closed, there is a closed line between the battery and starter motor. Connect starter to engine block. After being provided with power, starter turns crankshaft, then the engine will start.

2, Removal and installation



Starter Motor Components Figure

1 - M port 2-S port 3-B port

1) Removal

① Disconnect negative battery terminal.

Note: Before disconnecting negative battery terminal,

please take out the vehicle key first.

② Disconnect starter wiring harness connector

③ Remove mounting bolts of starter, take off starter.

2) Installation

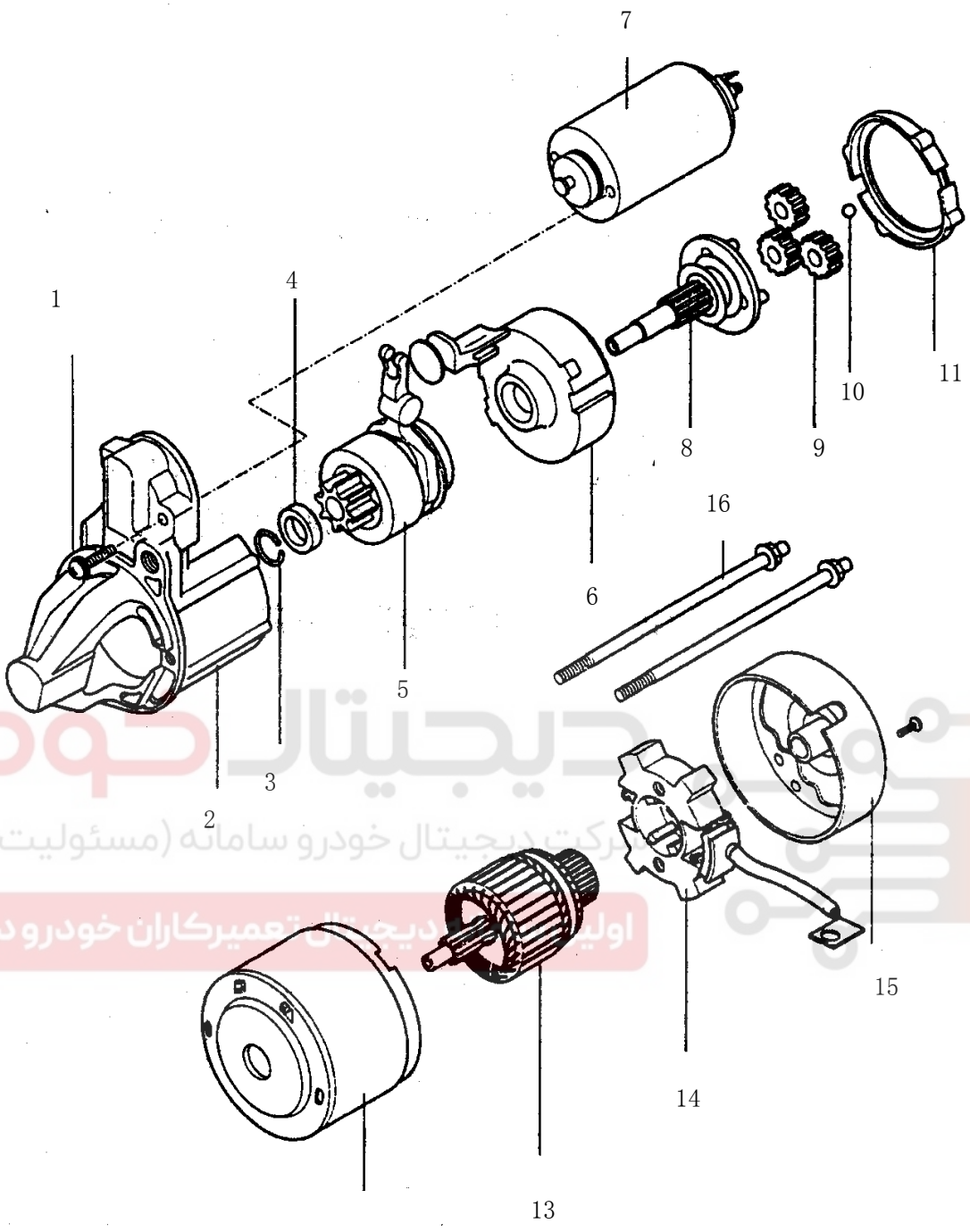
Install according to the reverse order of removal.

Note:

■Be sure to tighten the B “end nut

3, Disassembly and Reassembly

1) Disassembly



Exploded view of starter

1 - Screw 2 - Front support 3 - Retaining Ring 4-Ring 5-Pinion gear 6-Ring 7-Solenoid Switch

8-Stars gear 9 - Planetary gear 10-Ball 11-Gasket 12 - Stator 13 - Armature 14 - Brush holder

15 - Rear support 16 - Tighten bolts

2) Check

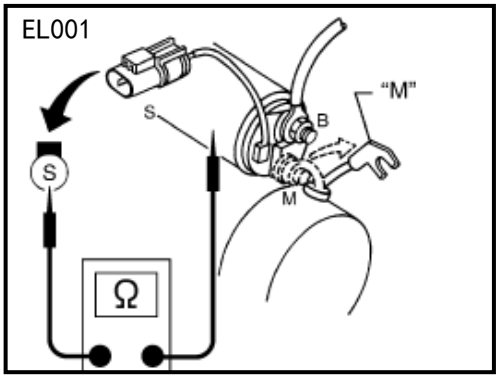
① Check solenoid switch

■Before checking, please disconnect negative battery terminal first.

■Disconnect "M" port of starter.

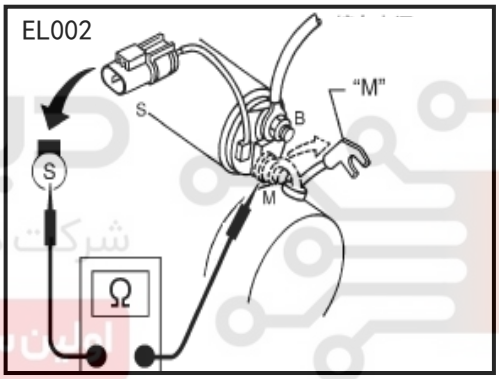
a. Test whether the "S" port and switch is connected or not.

■If not, please replace the solenoid switch.



b. Test whether the "S" port and "M" port is connected or not.

■If not, please replace the solenoid switch.



⊘ Check pinion gear

a. Visually check engaged gear's gear

■If the gear is worn or damaged, please replace it (please check gear of flywheel at the same time).

b. Check the gear of pinion gear.

■If the gear is worn or damaged, please replace it (please check the gear of Armature shaft at the same).

c. Check whether the pinion gear locks in one direction rotates smoothly in another direction.

■If the pinion gear can lock or rotate in both direction, or if there is no normal resistance, please replace it.

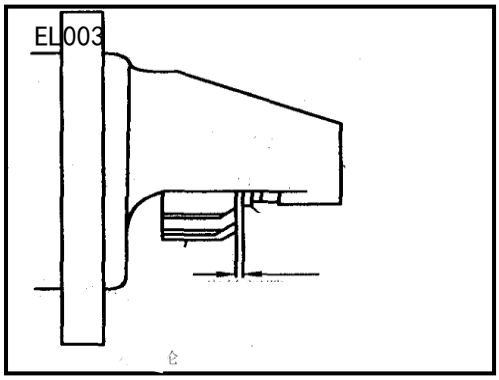
3) Assembly

When assembling the starter, please add high temperature grease to lubricate bearings, gears and friction surface. Do as the following instructions.

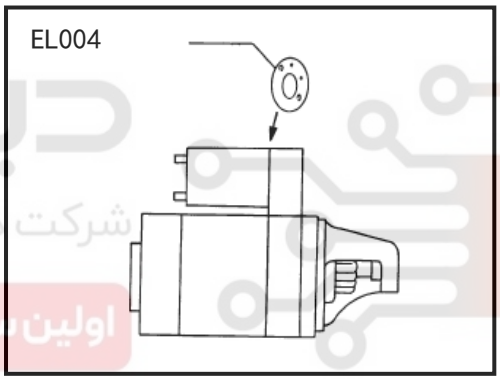
① Gear Clearance Adjustment

■Push the pinion gear out when the magnetic switch is powered on

Using a feeler gauge to check the clearance between pinion gear and thrust block.

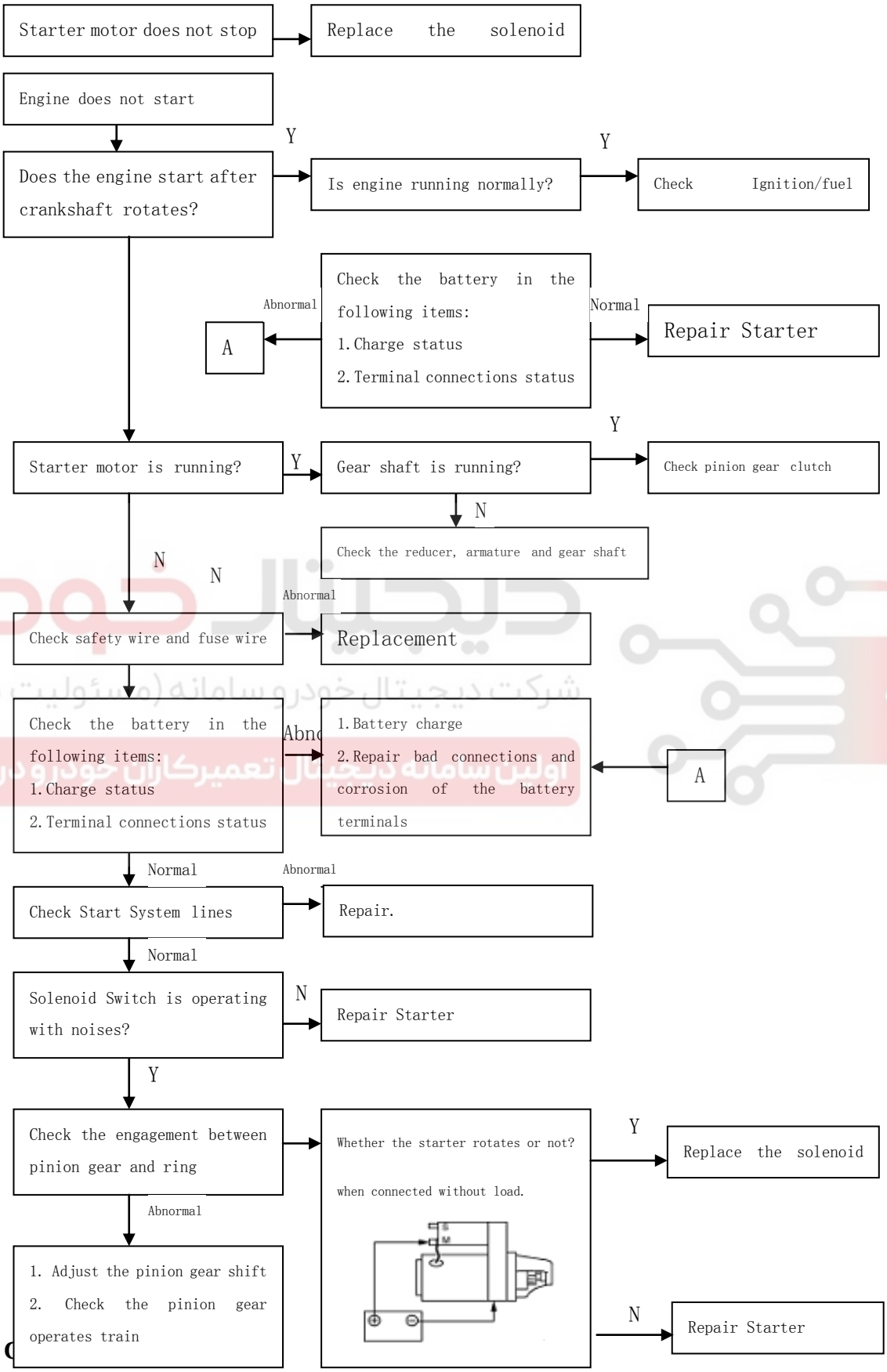


■If the clearance is not within the specified range, please use adjustment shims to adjust.



4, Common trouble diagnosis flow (if any abnormalities are found, please quickly disconnect the negative battery)

Start System common trouble diagnosis flow



1, System description:

Generators provide DC voltage to automotive electrical system and keep the battery charging status. Voltage output is controlled by IC regulator.

Port "B" is used to supply power to automotive electrical system and to provide power source for battery. IC regulator check the input voltage at Port 4 (the "S" port), and so as to control output voltage.

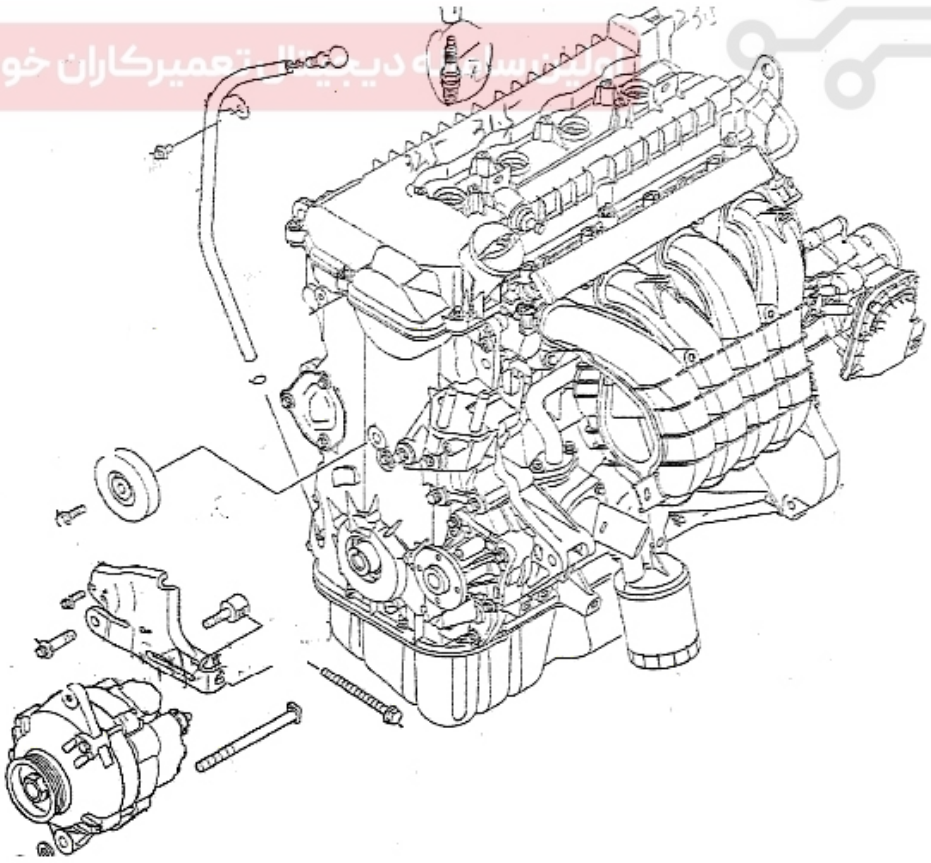
After being powered and grounded, charge warning lights will light on. When generators are able to provide sufficient high-voltage, ground line open, the charge warning light will light off. If the charge warning light remains on when the engine is running, that indicates a failure.

2, Charge warning light

If the generator works with the following occurs, the warning function of IC regulator will start and illuminate the charge warning light.

■No voltage or excessive high voltage

3, Removal and installation



1) Removal

① Disconnect negative battery terminal.

② Disconnect generator wiring harness connector

③ Loose generator adjusting nut and support nut

Then use the adjusting nut to adjust tension.

■Tightening torque: Generator adjusting nut: 22.5 ±2.5 N. M

Generator support nut: 47 ±5 N m.

④ Remove generator belt

⑤ Remove the generator from the vehicle.

2) Installation

■Install according to the reverse order of removal

■Install generator, please check the generator belt tension. Please refer to"Drive belts".

Note:

■Tighten the B “port nut

Tightening torque: 10～12N.m

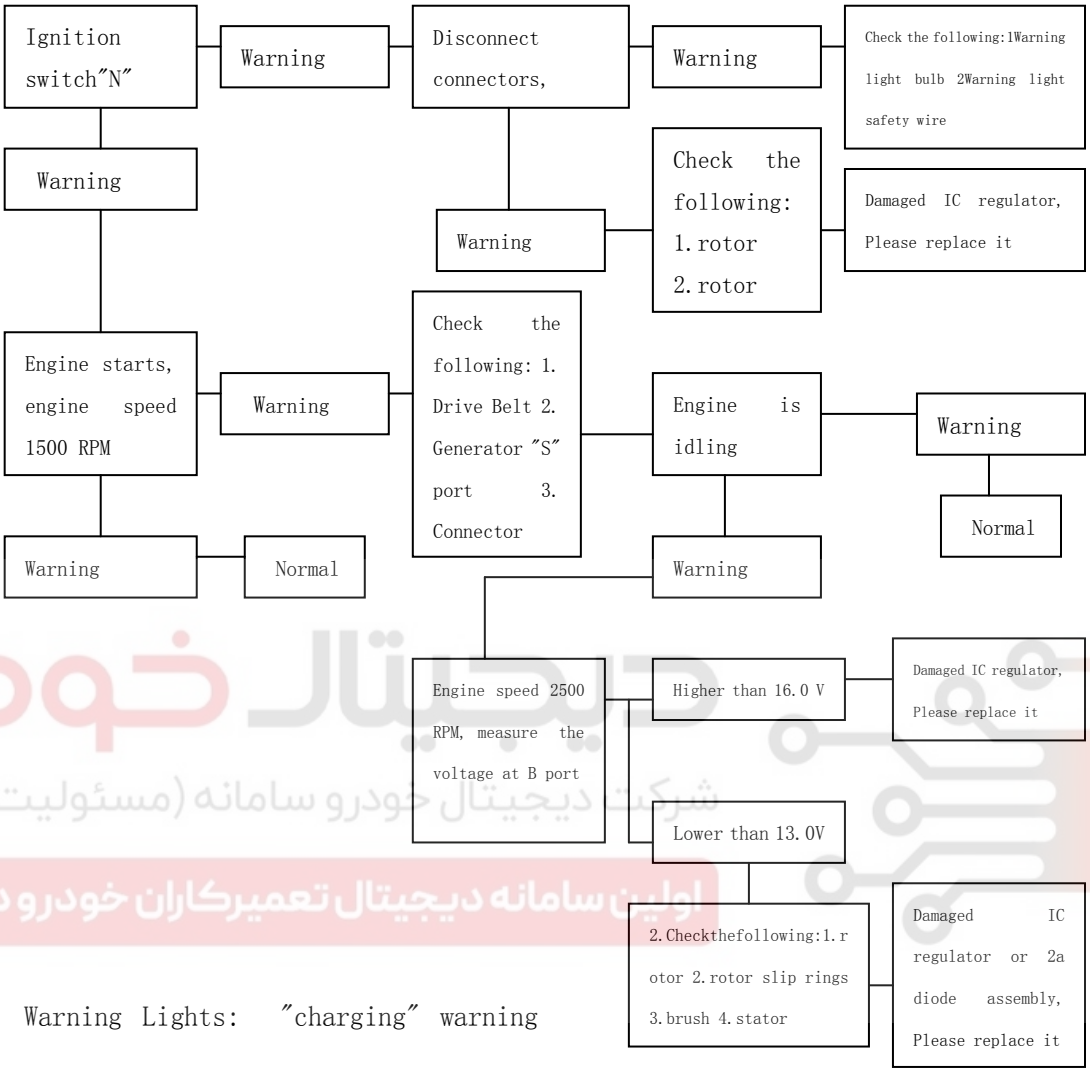
5, charging system trouble diagnosis

Before testing the generator, please confirm the battery is fully charged. Please use a 30V-voltmeter and suitable testing probe while testing. Reference to checking list will facilitate generator check.

■Before starting, please check fuse wire.

■Use a fully charged battery

Charging System trouble diagnosis flow



Note:

■If there is a problem with the charging system while the test result is normal; please check "B" port connection (check tightening torque and voltage).

■Check the condition of rotor coil, rotor slip ring, brush and stator coil

If necessary please replace the faulty parts.

Engine Electronic Control System

Precautions

Supplemental Restraint System Precautions

The supplemental restraint system (SRS) such as “air bag” and (SB) “seat belt pre-tensioner”, used along with the front seat belt, help reduce the risk or severity of injury to the driver and front passenger in the event of a vehicle collision. For the information of the proper maintenance of the system, please refer to the air bag section in the service manual.

Warnings:

■To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision, all maintenance operations must be performed by an authorized JAC dealership.

■Improper maintenance, including incorrect removal and installation of the SRS, can cause unintentional activation of the system which will lead to personal injury or death.

About the removal methods of clock spring (gossamer webs) and air bag controller, please refer to the airbag section.

■Do not use electrical test equipment on any circuit related to the SRS unless under the instruction of this manual. Airbag circuit wiring harness can be identified by the harness connectors.

General Precautions:

1、When checking the electrical control system, only the use of digital millimeter is allowed.

2、 During maintenance operation, please use JAC genuine parts. Otherwise the normal operation of the system cannot be ensured.

3、Only unleaded petrol is allowed to use during maintenance and use.

4、 When performing maintenance operation, please observe the standard service and diagnostic flows.

5、 During maintenance, it is forbidden to disassemble and remove the parts of the system.

6、During maintenance, please be cautious when take and put the electronics components (electronic control modules, sensors, etc.) to avoid dropping.

7、Establish a sense of environmental protection and effectively dispose of the wastes produced during maintenance.

Precautions during Maintenance

1、When performing simulation of thermal conditions of a malfunction or other maintenance operation that may make temperature rise, Do not allow temperature of the electronic control module to exceed 80℃.

2、For the fuel pressure of the fuel injection system is high (350 kpa), all the oil pipes used in the system must be able to withstand high pressure. Even when the engine is not in operation, the oil pipes still have maintained a quite high pressure. Therefore, during maintenance please note that do not easily remove oil pipes. if it is necessary to maintain the fuel system, please make sure that release the pressure in the fuel system before you remove oil pipes.

3、Removal of oil pipes and replacement of fuel filter should be performed by professional maintenance personnel at a well-ventilated place.

4、Do not energize the fuel pump when removing the electric fuel pump from the fuel tank so as to avoid producing electric sparks which will cause fire. Operation test of the fuel pump is not allowed with the pump dry or in water; otherwise service life of the pump will be reduced. In addition, never connect positive (+) and negative (-) of the fuel pump inversely.

5、When checking the ignition system, perform spark test only when necessary and for a duration as short as possible. During inspection, do not open the throttle; otherwise a large amount of unburned gasoline will enter the exhaust pipe causing damage to the three way catalyst.

6、Idle speed adjustment is completely accomplished by the electronic control system, so no manual regulation is required. The throttle stop screw of the throttle

body has been adjusted properly by the manufacturer at factory. Users are not allowed to change its initial position optionally.

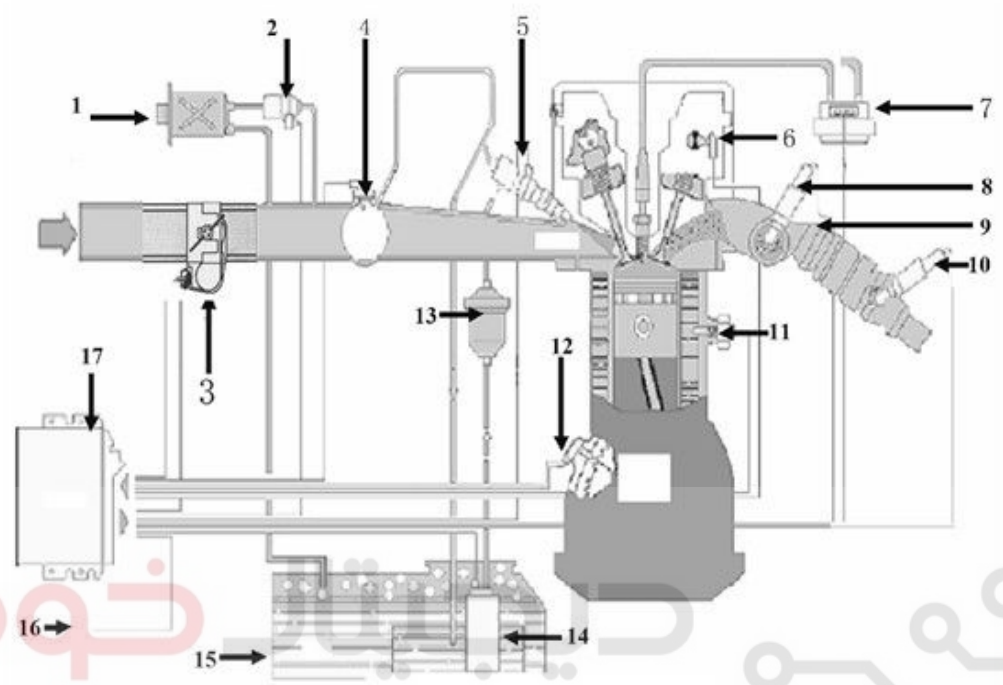
7、 When connecting the battery, do not misconnect its positive (+) and negative (-) so as to avoid damage to electronic components. This system uses negative ground (minus earth).

8、It is not allowed to remove the battery cable when the engine is running. Before on-vehicle welding operation, be sure to remove battery positive and negative cables and the ECU.

9、Do not detect input and output electric signals of parts by piercing wire skins.

Structural Principle and Maintenance of Engine Control System

System Description



Engine Control System

1- Canister 2-Canister Control Solenoid Valve 3 - Electronic Throttle Body Assembly 4 - Intake Air Pressure/Temperature Sensor 5 - Injector 6-Camshaft Position Sensor 7-Ignition Coil 8-Front Oxygen Sensor 9-Three Way Catalytic Converter 10-Rear Oxygen Sensor 11 - Engine Coolant Temperature Sensor 12 - crankshaft position sensor 13 - Fuel Filter 14 - Electric Fuel Pump 15 - Fuel Tank 16 - Diagnostic Interface 17 - Engine Control Module

Note:

■ This is the diagram of control system. If the sensor location is not in conformity with the entity, please refer to the entity.

Multi-point Fuel Injection System

1、 System Description

Multi-point fuel injection (MPI) system consists of the engine's electronic control module (ECM) and the sensor that detects the engine performance.

The control of the system is based on the sensors' signals.Each actuator operates under control of the ECM. The functions of ECM are to control fuel injection , idle speed and ignition timing,etc. Also, ECM has several diagnosis methods that can simplified the troubleshooting process when malfunctions occur.

2、Input/Output Signal

Input/Output Signal table

Sensor	Input signal to ECM	ECM	Actuator
Crankshaft position sensor(position)	Engine speed piston position	Fuel Injection and mixture ratio control	Fuel injector
Camshaft position sensor(phase position)			
Intake air pressure sensor	Air intake flow		
Intake air temperature sensor			
Oxygen sensor	Oxygen concentration of exhaust gas		
Electronic throttle position sensor	Throttle position		
Knock sensor	Engine Knock conditions		
A/C switch	A/C pressure		
Wheel speed sensor	Speed		
Engine coolant temperature sensor	Engine coolant temperature		

3、 Start Control

During start-up, special calculation method should be taken to control the air intake flow, fuel injection and ignition timing. At the beginning of the start-up, the air in the intake manifold is still while the pressure is same as the atmospheric pressure. When the throttle is switched off, the electronic throttle is specified as a fixed parameters based on the starting temperature. In a similar process, the specific "injection timing" is specified as the initial jet pulse. The fuel injection flow varies with the engine temperature so as to facilitate an oil film formation on the wall of the intake manifold and cylinder. Therefore, when the engine reaches a certain speed, the rich mixture shall be added. As soon as the engine starts running, the system immediately begins to reduce the cranking enrichment until it completely stops the cranking enrichment when the starting status is finished. (600 to 700 rpm) At the start-up, the ignition advance angle is also adjusted constantly, varying with the engine temperature, intake air temperature, and engine speed.

4、Heating control of the heater and three-way catalytic converters

After the engine is started at low temperatures, the air intake flow in cylinder, fuel injection and electronic ignition are adjusted to meet the requirement of higher torque; The process continues until the temperature reaches to the appropriate one. In this phase, the quick heating of three-way catalytic converters is the most important because exhaust emissions can be significantly reduced by the quick transition to the operation of three-way catalytic converters. In this condition, make use of the exhaust emissions to heat the three-way catalytic converters by moderately delaying the ignition advance angle.

5、 Acceleration/deceleration and motoring with fuel cut-off control

Some of the fuel that injected to the intake manifold will not be delivered to the cylinder in time to participate in the follow-up process. Instead, it forms a thin oil film on the wall of the intake manifold. With the workload increasing and the fuel injection lasting, the volume of fuel that stored in oil film will increase sharply. When the throttle opening is increased, some of injection fuel will be absorbed by oil film. Therefore, it is necessary to add appropriate fuel as compensation, and prevent gas mixture from thinning when accelerating. Once the load factor decreases, the additional fuel contained in the oil film on the wall of the intake manifold will be released, then during deceleration, there is a must to reduce the injection duration. Motoring or traction condition refers to the situation where the value of the engine power that provided to the flywheel is negative. In this case, the friction of engine and pumping losses are available to the vehicle deceleration. When the engine is in motoring or traction condition, the fuel injection is cut off to reduce consumption and emissions, and more importantly, to protect the three-way catalytic converters. Once the speed drops to a specific speed which is higher than idle speed and suitable for fuel supply, the fuel injection system restarts supplying. In fact, there is a speed range of recovery in ECM procedures. The range varies with the engine temperature, dynamic changes of engine speed and other parameters, and prevents the engine speed from decreasing to the specified minimum speed by calculating. Once the

injection system starts supplying fuel, the system starts the initial injection pulse to supply additional fuel, and reforms oil film on the wall of the intake manifold. After recovery of fuel injection, a torque-based control system makes the engine torque increase slowly and smoothly (smooth transition).

6、 Idle Control

When the engine is idling, it does not provide torque to flywheel. To ensure that the engine has a stable operation when the idle speed is as low as possible, the closed loop idle control system must maintain the balance between the torque produced by engine and the "power consumption" of engine. The idling needs a certain power to meet the load requirements. The load comes from the engine crankshaft, valve mechanism and accessories, such as internal friction in water pump. The torque-based system controls strategy. Based on closed-loop idle control, it decides the output torque for maintaining the required idle speed in any operation conditions. The output torque increases as the engine speed decreases, and decreases as the engine speed increases.The system responds to the new "interference factors" by requiring greater torque, such as the start and stop of the air conditioning compressors. When the engine temperature is low, the torque also increases to compensate for greater loss from internal friction or maintain a higher idle speed. All the requirements for output torque is passed to the torque coordinator. Then the torque coordinator figures out the gas density, the mixture composition and ignition timing by calculating.

7、λClosed-loop Control

The exhaust reprocessing of three-way catalytic converters is effective to reduce the concentration of harmful substance from the emissions. Three-way catalytic converters can reduce the hydrocarbon (HC), carbon monoxide (CO) and nitrogen oxides (NOX) with 98 per cent or more, and converts them into water (H_2O) , carbon dioxide (CO_2) and nitrogen (N_2). However, only when the engine excess air coefficient $\lambda=1$ and with a very narrow near range, can it attain such a high efficiency. The purpose of the λclosed-loop control is to ensure that the mixed

gas density is within this range. λClosed-loop control system only works when it is equipped with oxygen sensors. Oxygen sensors installed at the side of three-way catalytic converter detects oxygen content from emissions. Thin gas mixture（λ>1）generates about100 mV sensor voltage, while thick mixture（λ<1) generates about 900 mV sensor voltage. When λ=1, the sensor has a voltage leap. λClosed loop control responds to the input signal (λ>1= thin gas mixture, λ<1= thick gas mixture) by modifying the control variable and outputting correction factor as a multiplier to correct fuel injection duration.

8、Evaporative Emission Control

Due to the heat delivery of external radiation and the oil return, the fuel in fuel tank is heated which results in the fuel vapor. According to evaporative emissions regulations, the fuel vapor which contains much HC composition is not allowed to directly pump into the atmosphere. In the system, fuel vapor is collected in the charcoal canister through conduit, and flushed into the engine for combustion processes in due course. The flush air flow is achieved by ECM's control of the canister control valve. That only works, when the λclosed-loop control system is under operation.

9、Fuel Injection Control

The control of fuel injection timing and fuel injection pulse width supplies the engine with the best air/air-fuel ratio to keep pace with the changing operating condition of engine. Each of the cylinder inlets is installed with the injector. Fuel is pumped out from the fuel tank by fuel pump and sent to each fuel injector. Under normal circumstances, the crank operates every two circles while fuel is injected once to each cylinder. The working order of each cylinder is 1-3-4-2.

10、Ignition Timing Control

The power transistor of ignition primary circuit controls the ignition timing by switching on or off the primary current that flows to the ignition coil, and provide the best ignition timing based on engine operating condition. Ignition timing is controlled by ECM according to the engine speed, air intake flow, engine coolant

temperature and pressure of the atmosphere.

11、 Self-diagnostic Function

When abnormalities are detected by the sensor or actuator that related to the emission control, the engine warning light (the check engine light) is lit to inform the driver. That the abnormalities are detected by the sensor or actuator is equivalent to that the diagnostic trouble code of the abnormal situation will be outputted. RAM data in ECM which is related to sensors and actuators, can be read by diagnostic equipment. And in some circumstances, the actuators can be forced to drive.

12、Other Control Functions

1）Fuel Pump Control

Connect the fuel pump relay, and then it supplies electricity to the fuel pump when the engine crankshaft is running.

2) Fan Relay Control

The speed of radiator fan and condenser fan is controlled based on the engine coolant temperature, vehicle speed and switching signal of air condition (AC).

On-Board Diagnostic System

1、Description

The on-board diagnostic system (for short, OBD system) refers to a diagnostic system integrated in the engine control system for monitoring faulty parts affecting exhaust emission and main functions of the engine. It has the functions of identifying, storing and displaying [through self-diagnosis malfunction indicator light (MIL)] fault messages.

2、Fault Messages Record

The ECU continuously monitors sensors, actuators, related circuits, MIL, battery voltage and so on and even the ECU itself. Also it inspects credibility of output signals of sensors as well as driving signals and internal signals of actuators

(e.g. λ closed-loop control, coolant temperature, idle speed control, and battery voltage control, etc.). The ECU will set a fault message record in the RAM fault memory immediately once a link is found out of order or a signal value incredible. The fault message records are stored in the form of diagnostic trouble codes (DTCs) and are displayed in the order of appearance of faults.

Faults can be divided into “steady faults” and “incidental faults” (e.g. those caused by brief open circuit in harness or poor contact of connector) by frequency of occurrence.

3、Description and control strategies of malfunction indicator light

1）Malfunction Indicator Light （MIL): Indicates the removal of related parts or system failure according to law and regulations. MIL is generally an indicator light that can be displayed on the instrument panel and has a shape conforming to requirements of laws and regulations and standards.

2）MIL activation abides by the following principles:

①When ignition switch is turned ON (without starting the engine), the MIL will keep lighting up.

②If there is no fault request for MIL lighting up in the fault memory 3 seconds after engine start, the MIL will go out.

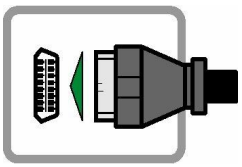
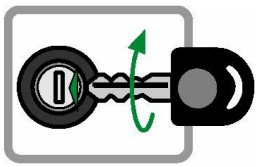
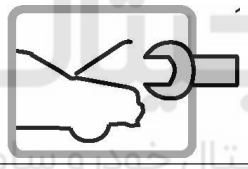
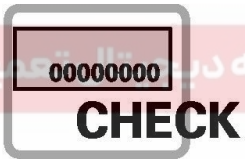
③When there is a fault request for MIL lighting up in the fault memory or a same request outside the ECU, the MIL will light up.

④When there is a MIL flashing request outside the ECU, or a misfire cause requiring MIL flashing, or a fault request for MIL flashing in the fault memory, the MIL will flash at a frequency of 1Hz.

4、 Troubleshooting Steps

1）For vehicles with OBD functions, their troubleshooting should generally follow the procedure below:

Service Procedure Chart for OBD Malfunctions

	1.Connect diagnostic test equipment to diagnostic interface, and turn on the equipment.
	2.Turn ignition switch ON.
	3.Read fault-related information [DTCs, freeze frames (FFs), etc.]; refer to the service manual and recognize faulty components and fault types; prepare maintenance scheme according to fault-related information and experience.
	4. Perform troubleshooting.
	5.Clear fault memory; drive your vehicle appropriately with driving patterns satisfying corresponding trouble diagnostic criteria; read fault information and make sure the trouble has been cleared.

Engine Troubleshooting

1、Troubleshooting overview of engine control system

If the electronic engine control system components (e.g. sensors, ECM, injectors, etc.), Have malfunctions, fuel supply interruption, or wrong supply of fuel capacity for the engine in different conditions, the followings will occur.

a.Difficult or completely unable to start the engine

b.Unstable idle speed

c.Poor driving performance

If any of the above occurs, firstly carry out the routine tests including the engine basic checks (ignition system failure, engine correct adjustment etc.). Then check the engine electronic control system components with fault diagnosis instruments.

Note:

■ Read the diagnostic trouble codes first before removing or installing any parts, and then disconnect the negative battery terminal.

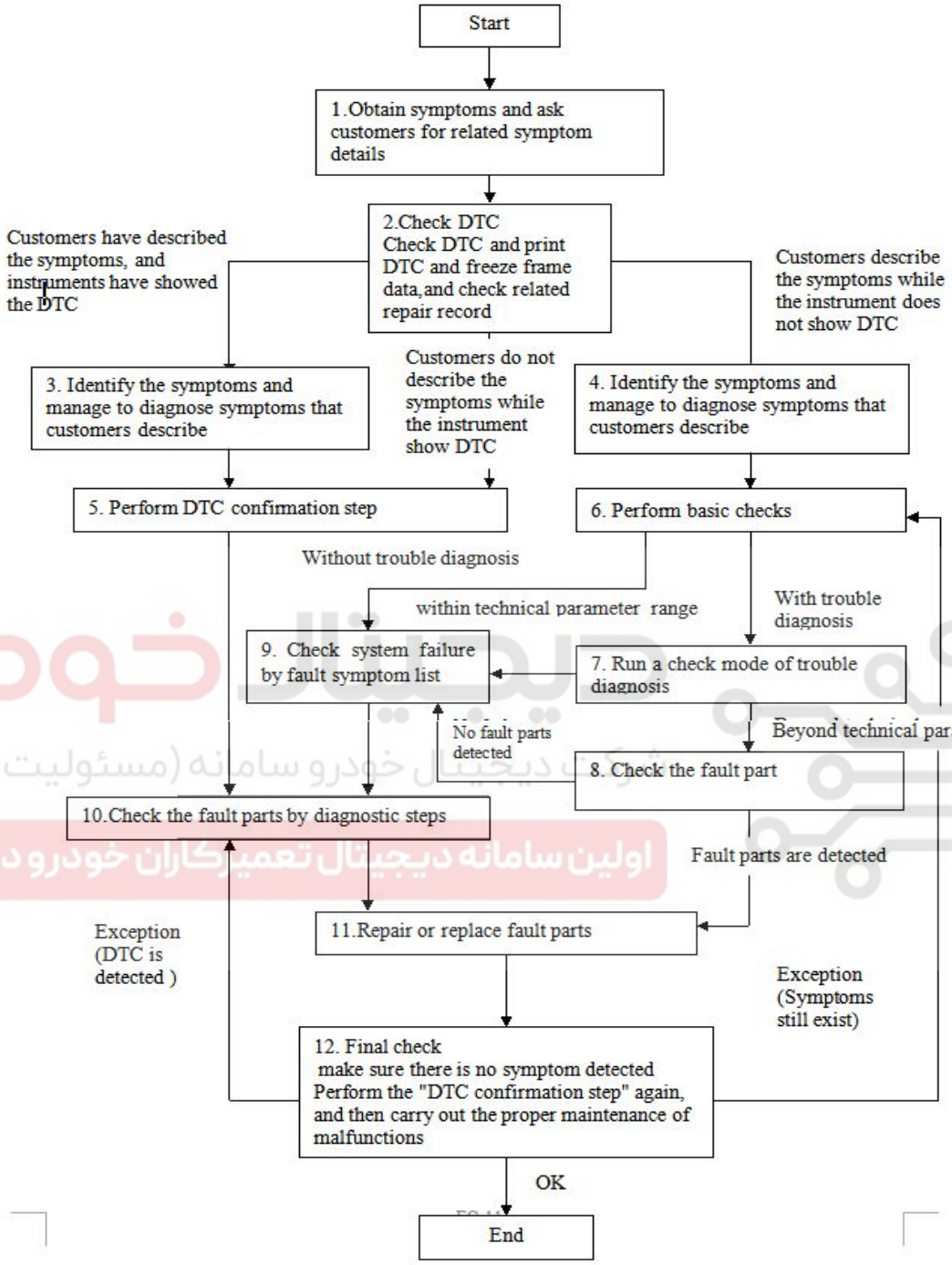
■Please disconnect the wiring harness to the battery terminal before you turn off the ignition switch. If the engine is running or the ignition switch is turned on, the disconnection of the battery harness will cause damage to ECM.

■The harness between ECM and sensors should be shielded by the shielded ground wire that connected to the car body, which aims to prevent the ignition system interference and radio interference. If the shielded wiring harness malfunctions, wire harness must be replaced.

■Check the alternator charging status, and do not disconnect the battery positive to avoid ECM damage.

■When using an external charger to charge the battery, please disconnect the battery terminals to avoid ECM damage.

2、Trouble Diagnosis Flowchart



3、Fault symptom check list

Fault symptom check list

Fault Symptom		Check
Unable to communicate with the diagnostic scanner	Unable to communicate with all system	1
	Only unable to communicate with ECM	2
Engine warning light and the corresponding components	When the ignition switch is turned on ,the engine warning light does not light up immediately	3
	Engine warning lights light up simultaneously and do not go out	4
Start	No initial ignition (unable to start)	5
	With initial ignition, but not completely burned (unable to start)	6
	Long start-up time (unable to have a normal start)	7
Idle speed stability (idle speed abnormality)	Unstable idle speed (idle speed fluctuations, hunting)	8
	High idle speed (idle speed abnormality)	9
	Low idle speed (idle speed abnormality)	10
Idle speed stability (engine flameout)	When engine is cold, flameout occurs during idling (flameout in deceleration)	11
	When engine is hot, flameout occurs during idling (flameout in deceleration)	12
	Engine flameout occurs in start (flameout in acceleration)	13
	Engine flameout occurs in acceleration	14
Driving	Surge in vehicle and decrease or instability of vehicle speed	15
	There is an impact or vibration when accelerating	16
	There is an impact or vibration when slowing down	17
	Poor acceleration performance	18
	Surge	19
	Cylinder knocking	20
Unable to stop		21
High CO and HC concentration during idling		22

Low alternator voltage	23
Idle speed is abnormal when the air conditioning is turned on	24
Fan is not functioning properly	25

4、Fault symptom list

Fault symptom list

Items		Symptoms
Start	No start	Starter drag engine, but if no combustion in the cylinder, the engine will not start
	Engine stops after combustion	There is combustion in the cylinder , but the engine stops immediately
	Hard starting	Engine starts after crankshaft operates for a few minutes
Idle speed stability	Hunting	Engine speed is not constant and changes within idle speed range
	Idle speed fluctuations	Usually, it can be judged by the swing of tachometer pointer, as well as the vibration that is passed to the steering wheel, shift lever, and body, etc.
	Idle speed is not correct	Engine is idling in the incorrect speed
	Flameout occurs (flameout in deceleration)	When the foot is off the accelerator pedal, engine stops no matter whether the vehicle is moving or not.
	Flameout occurs (flameout in acceleration)	When accelerator pedal is hit or stepped on, the engine stops
Driving	Surge in vehicle and decrease of vehicle speed	"Surge phenomenon " is a phenomenon that the motor speed (engine speed)is slower than the current speed when speed pedal is hit to speed up, or there is a temporary speed (engine speed) decline during acceleration
	Poor acceleration performance	Poor acceleration performance refers to that the vehicle cannot obtain a throttle opening to change the speed, which is still a fault even accelerating smoothly; or refers to the incapability to achieve the maximum speeds
	Instability	Engine speed increases slowly when first hitting the accelerator pedal to speed up
	Impact	A large impact or vibration can be sensed when the engine speed up or slow down
	Surge	There is a repeated surge forward when driving at a constant speed or variable speed
	Cylinder knocking	A strong voice which is like a hammer striking against the cylinder wall during driving, is harmful to driving

Parking	Continuous running (Unable to stop)	

5、Basic Fault Check

When check the engine failure, the first should be the basic system check in terms of order. If there are the phenomena of engine failure to start, unsteady idle speed and insufficient fuel supply, please check the following basic systems:

a. Power Supply: battery, fusible line and blown fuse.

b. Earth wire

c. Fuel supply: oil tube, fuel filter and fuel pump.

d. Ignition system ignition plug, high-tension and line ignition coil.

e. Emission Control System: vacuum leaks

f. Others: ignition timing and idling.

The Electronic Engine Control System failure is usually caused by poor contact of the harness connector; therefore check all the wiring harness connector to verify that they are properly connected.

6、Idle Speed Check

1）Check Conditions

Note:

■First of all, check the general projects including ignition plug, fuel injector, and cylinder compression pressure and so on.

①Engine warms up.

② Lights, electronic fan and all of the other accessories are turned off.

③ the transmission is in neutral.

④ Steering wheel is in the middle (with power steering system).

2） Connect diagnostic apparatus

3）Start engine and make it run at the minimum idle speed.

4) Make the engine run for 5s or more at the speed of 2000 to 3000 r/min.

Then, make the engine idle for 2 minutes.

5) Read the idle speed (750±30r/min).

7、 Fuel Pressure Test

Note:

■Release the pressure in fuel line first to eliminate dangers before disconnecting the fuel line

■Always use the" O" ring to maintain good sealing performance of the connector of fuel hose.

■Please do not operate electric system when you check.

Note: Prepare a container to avoid fuel spills before disconnecting the fuel lines.

1） Release the fuel pressure to zero. Please refer to "Release fuel pressure" section.

2) Remove the fuel pressure check nut from the fuel injector rail.

3） Connect the fuel pressure gauges.

4) Turn the ignition switch to the "ON" position and check whether there is a fuel leak.

5) Start the engine and male it idle, and check whether there is a fuel leak.

6) Take the reading on the fuel gauge.

■The fuel pressure：350KPa

Note:

■Do not perform Fuel Pressure Check when the system is running.

■During checking the fuel pressure, always make sure to check the junctions of fuel pipes for leakage.

7) If the measurement of the fuel pressure is beyond the standard value, analyze the possible cause in accordance with the following table, then carry out necessary maintenance

Fuel System
Troubleshooting
table 1

Trouble Symptoms:	Possible causes	Solutions to troubles

Oil pressure is too low	Fuel filter is blocked	Replace the fuel filter
	Pump damage or fuel leak in the fuel return pipe at the side of oil pressure regulator	Replace fuel pump.
Oil pressure is too high	Oil pressure regulator cementation	Replace fuel pump.
	Fuel return pipe is blocked or bent	Repair or replace fuel pipe.

8) Stop the engine and check the reading changes of fuel pressure gauge for 5 minutes. If oil pressure gauge reading drops, observe the lower rate. Analyze and perform troubleshooting according to the following table.

Fuel System
Troubleshooting
table 2

Trouble Symptoms:	Possible causes	Solutions to troubles
Oil pressure declines slowly after engine stopped	Fuel injector leakage	Replace fuel injector
Oil pressure declines completely after engine stopped	Fuel pump faults	Replace fuel pump.

9) Reduce the pressure in the fuel line.

10) Disconnect the fuel pressure gauge and install the check nut.

11) Check whether there is a fuel leak or not by the following steps.

①Turn ignition switch to “ON” position (do not start engine), and check the junctions of fuel pipes for leakage.

②Start engine and rev it up, and re-confirm that whether there is leakage at connections of fuel system or not.

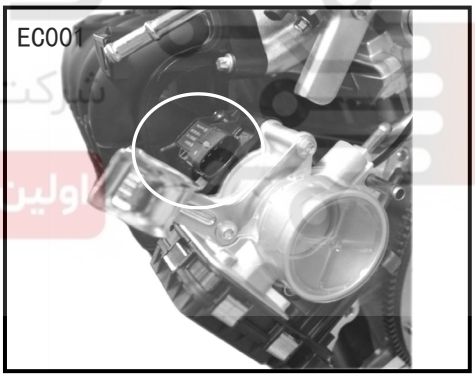
Structural Principle and Maintenance of Engine electronic components

Intake Air Pressure/Temperature Sensor（MAP/MAT）

1、Component Description

Intake air pressure/temperature sensor is used to measure the absolute pressure and intake air temperature of the intake manifold, providing the information of engine load and intake air temperature. The piezoelectric to measure intake air pressure can provide "the load signal" to the controller according to the differential between atmospheric pressure and the intake manifold pressure; 5 V voltages is provided by the controller. And 0-5 V voltage is back fed to the controller in accordance with the intake air pressure.

NTC (negative temperature coefficient) sensor whose resistance changes with the intake air temperature to measure the intake temperature, transmit the voltage that indicates the temperature change to ECU.



2、Installation Positions of Components:

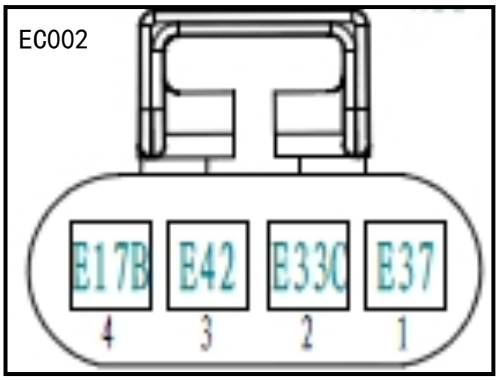
It is mounted behind the throttle body; please refer to the diagram at the right.

3、Terminal Definition

Terminal 1 (grounded): By ECU (17 # pin) grounded

Terminal 2 (temperature signal: output temperature signal to ECU (42#pin)

Terminal 3 (5V power supply): ECU (33# pin) provides 5V voltage



Terminal 4 (temperature signal: output temperature signal to ECU (37#pin)

Working voltage：5±0.1V

3、Trouble Diagnosis

- No signal fluctuations；
- Sensor signal improper
- The intake air pressure detected by sensor is above the upper limit.
- The intake air pressure detected by sensor is below the lower limit.
- The voltage of temperature signal is too low.
- The voltage of temperature signal is too high.

4、Troubleshooting

- Check whether there is a short circuit or open circuit in the connection between the ECU and 4 wires of the sensor.
- Whether the sensor inspection holes are blocked.
- Whether there is a short circuit, open circuit or grounded circuit among the sensor harness.
- Disconnect the sensor harness and turn on the ignition switch, and the voltage value of terminal 3 should be 5V.
- To measure the temperature sensor's characteristics: disconnect the sensor harness, and measure the sensor's resistance between terminal 1 and terminal 2. (Resistance Reference Value: 0℃-5280～6570Ω，20℃-2280～2740Ω，40℃-1060～1300Ω，60℃-530～660Ω）
- Measure the voltage of the pressure signal. (Pressure Signal Reference Value：20kPa-0.40V,35kPa-1.10V,
  95 kPa - 3.80 V, 115 kPa - 4.65 V)
- Check whether the sensor has been exposed to a impact that can cause a sensor failure.

■ Range of working pressure : 10kPa～115kPa

■ Range of operating temperature：-40～125℃

5、Removal and Installation

1) Removal

① Disconnect the harness connector of the intake air pressure/temperature sensor.

Note:

■Make sure ignition switch is in OFF position.

② Remove the mounting screws of the intake air pressure/temperature sensor, and take off the sensor with crosshead screwdriver.

2）Installation.

Please note the followings and install in the reverse order of removal.

■Apply a little engine oil to sensor seal ring for easier installation.

■Make sure sensor and intake manifold have fitted perfectly.

■Make sure harness connector is installed securely.

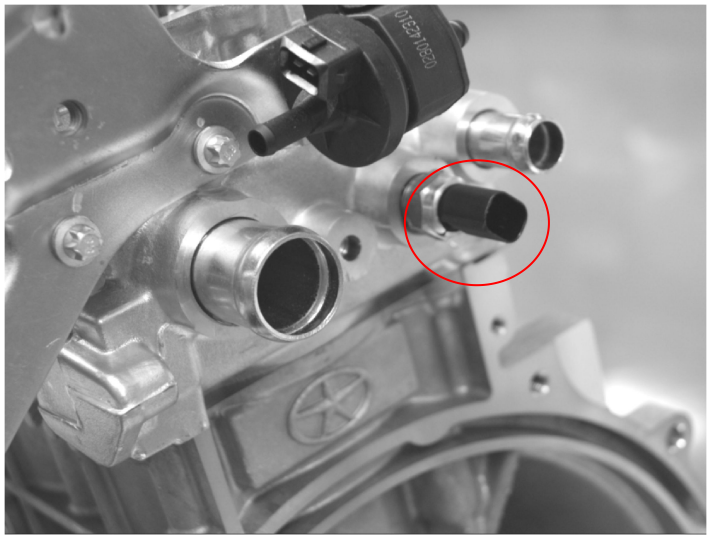
Engine Coolant Temperature Sensor

1、Component description

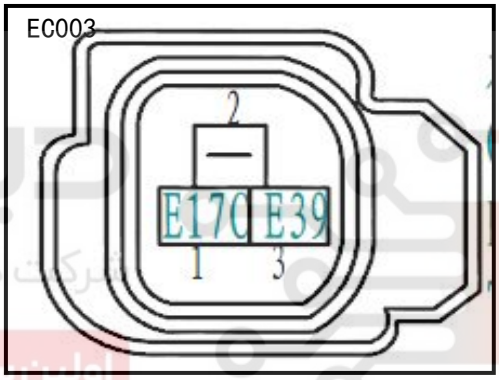
The engine coolant temperature sensor detects the coolant temperature of the engine, and then sends the signal to ECM for the control of starting, idling,ignition timing during normal operation and the pulse width of fuel injection. Simultaneously the sensor provides water temperature signal to the gauge for displaying temperature. It uses a negative temperature coefficient thermistor whose resistance value decreases with temperature rise.

2、Installation Positions of Components

As the installation positions, please refer to the diagram.



3、Terminal Definition



Terminal A (water temperature signal): Outputs cooling water temperature signal To the ECU (39#pin);

Terminal B: connected to water thermometer.

Terminal C (grounded): grounded by ECU (17 # pin)

4、Trouble Diagnosis

- The signal of water temperature is above the limit.
- The signal of water temperature is below the limit.
- Water temperature sensor with short circuit or open circuit

Data of normal temperature resistance value：2.5±5% kΩ。

Characteristics of the sensor's temperature-resistance:

I - ECU		II - Gauge	
Temperature °C	Standard resistance kΩ	Temperature °C	Standard resistance Ω

-20	13.71 - 16.49	60	100-120
25	1.825-2.155	90	41-46
80	0.303-0.326	115	24-26
110	0.1383-0.1451	120	20.5-23.5

5、Troubleshooting

- Check whether there is a short circuit or open circuit in the connection among the 3 wires in the sensor, the ECU and the gauge .
- Whether there is a short circuit,open circuit or grounded circuit among the sensor harness;
- The wires poorly grounded will easily lead to a high indication of the water temperature gauge of the engine;
- Working voltage：5V;
- Range of operating temperature：-40～135℃.

6、Removal and installation

1) Removal

① Drain engine coolant from the radiator

Please refer to “Changing engine coolant”.

② Disconnect the harness connector of engine coolant temperature sensor.

③ Remove engine coolant temperature sensor

2）Installation

Please note the followings and install in the reverse order of removal.

■Smear threaded portion of the sensor with plane seal gum, and tighten it as required.

Tightening torque：11-16N.m

■Make sure harness connector is installed securely.

Start the engine and turn it to idle running. Visually check for engine coolant leakage.

Electronic Throttle

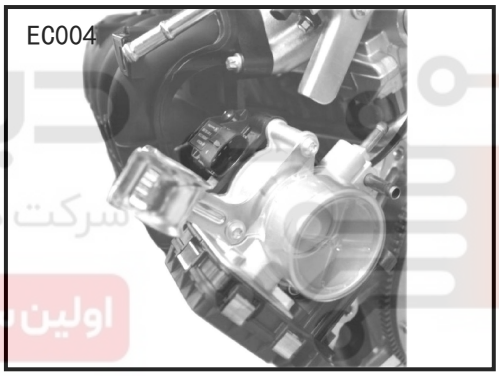
1、Component Description

Electronic Throttle body assembly is one of the key parts of the intake control management system in modern engine management systems. It has direct control over the engine air intake volume, which in turn controls the speed of the engine and the output power.

The mechanical control system that control the throttle body mechanically is removed from electronic throttle body while the drive motor and drive gear mechanism are added as well as necessary mechanical drive components and the special throttle position sensor that is more powerful in terms of functions and reliability.

2、Installation Positions of Components

It is mounted on the intake manifold.



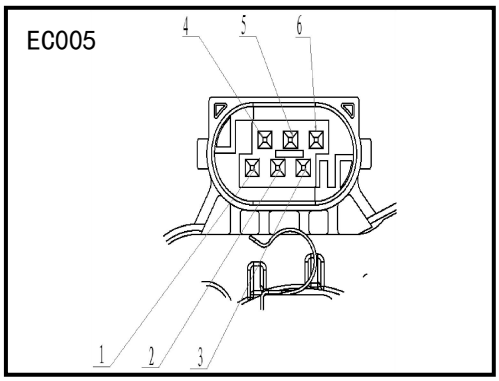
3、 Throttle Terminals Definition

Terminal 1 (motor negative): connected with ECU (66 #、67# pin);

Terminal 2 (sensor grounded): By ECU (78# pin) grounded

Terminal 3 (sensor supply): power supplied by ECU (32# pin)

Terminal 4 (motor positive): connected with ECU (64#、65# pin)



Terminal 5 (signal 2): connected with ECU (38# pin)

Terminal 6 (signal 1): connected with ECU (40# pin)

4、Trouble Diagnosis

- Drive motor failure of the throttle body:
  - ✓ Open circuit of drive motor assembly;
  - ✓ Short circuit of the internal coil in drive motor assembly;
  - ✓ The internal line of drive motor assembly is burned out;
  - ✓ Excessive wear or damage inside the drive motor assembly.
- Riveting failure of the throttle body:
  - ✓ Excessive wear and damage of the throttle body gear.
  - ✓ Bearing seizure and damage of the throttle body gear ;
  - ✓ Poor contact of throttle position sensor; instable output signal;
  - ✓ Valve that clogged by debris or sludge should be given periodic cleaning.

5、Troubleshooting

- Mainly check whether there is a short circuit,open circuit or grounded circuit between the sensor and ECU harness;
- Use multimeter to detect whether there is a beating between the sensor signal port and ground wire when the throttle is switched on or switched off;
- Adaptive temperature to working conditions:-40～125℃;
- Throttle Response Time:≤100ms (fully open to fully closed), ≤150ms (fully closed to fully open)

Throttle position sensor measurement range:

Voltage division ratio		Angle sensor 1	Angle sensor 2
New State	BDC	10%±4%	90%±4%
	TDC	93%±4%	7%±4%
Old State	BDC	10%±5%	90%±5%
	TDC	93%±5%	7%±5%

6、Removal and installation of throttle position sensor

1) Removal

① Disconnect TPS harness connector.

Note: Make sure ignition switch is in OFF position.

② Remove throttle body assembly.

③ Remove bolt securing TPS, and take off the sensor.

2） Installation

Please note the following procedure and install in the reverse order of removal.

■Make sure harness connector is installed securely.

■Tightening torque：5.5～6.5 N·m

Crankshaft Position Sensor and Camshaft Position Sensor

1、Component Description

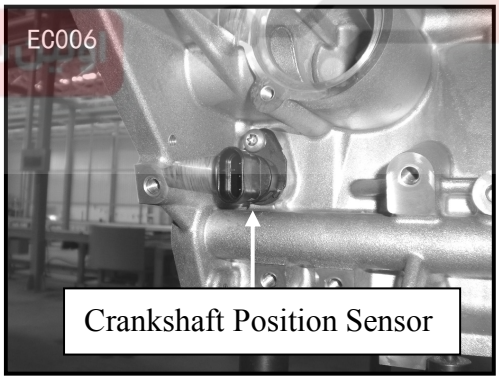
The Camshaft Position Sensor and Crankshaft Position Sensor belong to the category of Hall Sensor.They operate with the camshaft and crankshaft signal wheel which is corresponding to a specific location of the engine.According to the sensor's digital voltage signal ECU determines the working conditions of engine, and implements a one-to-one control.

Performance:

Operating temperature: -40～150℃

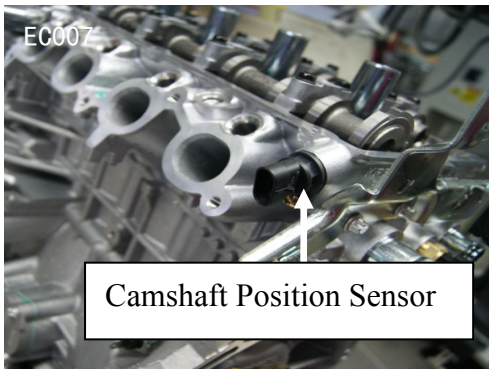
System Input voltage: 5.0 V (power supplied by the controller)

The clearance: 0.1 - 1.5 mm



2、Installation Positions of Component

Separately installed near the camshaft and crankshaft



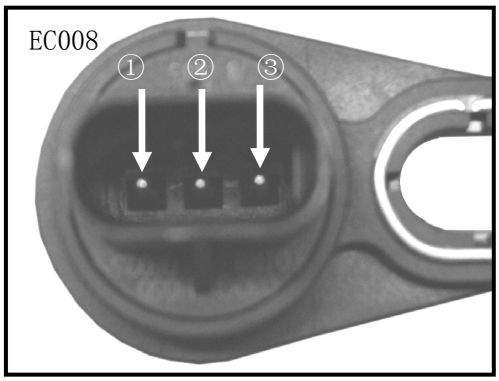
3、Terminal Definition

Crankshaft position sensor:

Terminal 1: power supplied by ECU (33# pin) （5V）

Terminal 2: signal outputted to ECU (15#pin)

Terminal 3: grounded by ECU (17#pin)

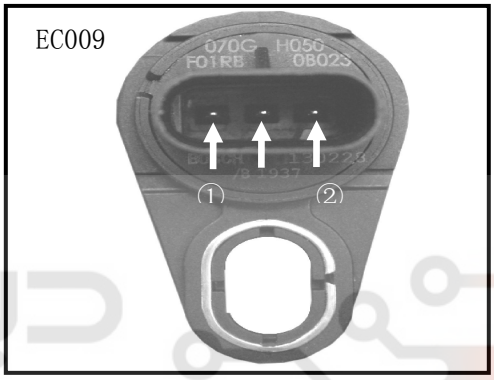


Camshaft position sensor:

Terminal 1: power supplied by ECU (32# pin) （5V）

Terminal 2: signal outputted to ECU (79#pin)

Terminal 3: grounded by ECU (36#pin)



4、Trouble Diagnosis

The ECU carries out real-time monitoring on sensor and wires

- Sensor open circuit;
- Sensor Internal short circuit
- Line-to-ground Sensor Hall elements;
- Short circuit between the Sensor Hall elements and system reference voltage signal line.

5、Troubleshooting

- Check whether the sensor line is normal or the line is shorted to ground.
- Use Tee connecting sensor and the harness connector for to check whether the power, ground wire and signal lines are connected properly.

6、Removal and installation

1) Removal

① Disconnect Crankshaft position sensor and harness connector of the Camshaft Position Sensor

② Remove bolt securing CKP sensor, and take off the sensor.

2）Installation

Please note the followings and install in the reverse order of removal.

■Pay attention to mounting clearance

Standard value: 0.1～1.5mm

■Tightening torque: 8～10 N·m

Oxygen sensor

1、Component Description

Oxygen sensor is used to provide the information that whether oxygen is excess after complete combustion of intake air and fuel that injected into the engine cylinder. Based on this information, ECU takes a closed loop control of fuel amount to ensure that the three main toxic ingredients in engine exhaust can achieve maximum transformation and purification from the operation of three-way catalytic converter.

The sensing component is a kind of ceramic tube with pores.The outside tube wall is surrounded by engine while the inside is open to the atmosphere. The sensor indirectly calculates pulse width of fuel injection according to the difference of oxygen concentration outside and inside and deliver the difference to ECU which in turn controls fuel injection again. Also test the data outputted by rear Oxygen Sensor, and make a comparison between the data outputted by front oxygen sensor and the rear one to monitor whether three-way catalytic operates well.

Oxygen Sensor operating voltage fluctuates between 0.1v and 0.9 V with the frequency of 5 to 8 times in 10s. Those aged sensor whose frequency is below that value needs to be replaced. And the sensor cannot be repaired.

2、Installation Positions of Components

The front (upstream) oxygen sensor is mounted on the exhaust manifold portion in front of three way catalytic converter (catalyst).

The rear (downstream) oxygen sensor is mounted behind three way catalytic converter.

3、Terminal Definition

Front oxygen sensor

Terminal 1 (heater wire +): power supplied by main relay;

Terminal 2 (heater wire -): connected with ECU (26# pin);

Terminal 3 (grounded): grounded by ECU (36# pin);

Terminal 4 (signal): output signal to ECU (18#pin).

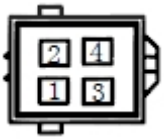
Rear oxygen sensor

Terminal 1 (heater wire -): connected with ECU (28# pin);

Terminal 2 (signal): output signal to ECU (55#pin).

Terminal 3 (heater wire +): power supplied by main relay;

Terminal 4 (grounded): grounded by ECU (36# pin).



4、Trouble Diagnosis

The ECU detects the oxygen sensor line, ECU internal power amplification circuit and detection circuit. Once one of the following situations is found, oxygen sensor fault location is set:

- The battery voltage is not credible
- The manifold absolute pressure signal is not credible
- Engine coolant temperature signal is not credible
- Drive fault of fuel injector

After oxygen sensor fault location is set, the closed loop control of fuel amount is turned off and fuel amount is determined by the basic fuel injection time that stored in the ECU.

5、Trouble Diagnosis

- Mainly check whether there is a poor plug connection between the wires of the sensor ,a short circuit or open circuit;
- Sensor damage is generally caused by the lead and phosphorus poisoning, therefore pay attention to the quality of oil products, as well as the engine excessive oil consumption which is also likely to lead to sensor failure.
- The frequency of oxygen sensor changes should not be less than a certain number of times in a certain period.

6、Removal and Installation

1) Removal

① Disconnect oxygen sensor harness connector

② Using oxygen sensor special socket to remove oxygen sensor

Note:

■Seal mounting hole of oxygen sensor with lint-free cotton yarn to prevent foreign materials or oil/water from entering exhaust manifold

■Visually check oxygen sensor appearance.

Brownish red: lead poisoning

Off white: normal

Black: carbon deposition

2）Installation

Please note the followings and install in the reverse order of removal.

- Pay attention to the route of oxygen sensor harness.
- Tightening torque：40～60 N·m
- After replacing the oxygen sensor, rust inhibiting oil should be smeared on the Oxygen Sensor to prevent rust which can be an obstacle of removal.

Fuel injector

1、Component Description

The fuel provided by injection pump is stored and allocated by fuel pressure rail component, which provides a more stable pressure environment for fuel system, balancing the cylinder pressure and fuel supply to make the engine running smoothly. The fuel injector injects fuel according to injection signals transmitted from the ECU and determines fuel injection flow by the opening time of fuel injector solenoid valve.

2、Installation Positions of Components

They are installed on the fuel rail.

3、Terminal Definition

Terminal 1 (power supply): after relay power supply;

Terminal 2 (signal): connected with the ECU (first cylinder 27#pin, second cylinder 6#pin, third cylinder 7 #pin, fourth cylinder 47#pin).

4, Components inspection:

Note:

■Please clean and analyze fuel injectors using the special fuel injector cleaner and analyzer within a certain period.

1）Check resistance

Note: Check after harness connector is disconnected.

■Standard resistance value: 11-16Ω

2） Use trouble diagnostic tester to check the working time of fuel injector

■Standard working time: 2.0～3.0ms at idle (increased at acceleration).

3）Check operating sound of each fuel injector

Note:

■Listen to click sound of fuel injector at idle with stethoscope, or check the vibration of fuel

injector with fingers.

If no vibration is perceived, check harness connector, injector, or ECU signal controlling fuel injector.

5、Removal and installation

Please refer to "Fuel System" section.

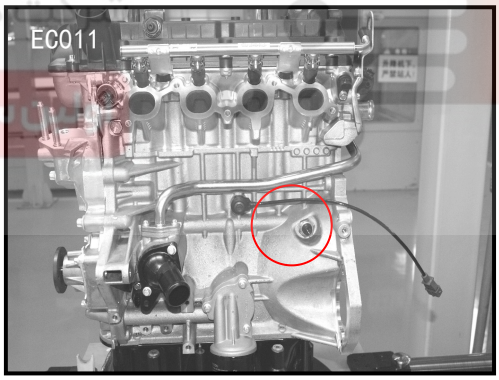
Knock sensor

1、Component Description

Knock Sensor is installed at the side of the cylinder typically between Cylinder-2 and Cylinder-3, which is conducive to engine knock balance. ECU makes use of the vibration frequency signal outputted from of the knock sensor to pass through its internal filtering, which in turn determines whether there is an engine knock. When a knock signal is detected, ECU will gradually decrease until there is no knock, and then recovers gradually until to the knock edge,and so forth.

2、Installation Positions of Components

They are mounted at the side of cylinder.



3、Components inspection

1）Terminal Definition

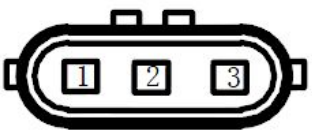
Terminal 1(Knock sensor signal A):

sends signal to ECU (19#pin);

Terminal 2(Knock sensor signal A):

sends signal to ECU (20#pin);

Terminal 3 (shield)



2）Check resistance

Resistance values: >1MΩ（25±5℃）

4、Trouble Diagnosis:

The ECU detects the knock sensor, power amplification circuit and detection circuit. Once one of the following situations is found, knock sensor fault flag bit is set:

- Knock sensor fault;
- Knock control data processing circuit fault;
- Sub-cylinder signal is not credible;
- Sensor line fault.

After the knock sensor failure position is set, knock closed loop control is turned off, and the ignition advance angle stored in the ECU is fixed in a safety angle by the software application. When the error frequency of drops below the set value, fault flag bits are reset

5、Removal and Installation

1) Removal

① Disconnect knock sensor harness connector.

② Remove knock sensor lock bolt, and take off the sensor.

Note:

■Do not drop or damage the sensor.

2）Installation

Install according to the reverse order of removal.

■Tightening torque: 16～24N·m

A/C Switch and Relay

1、Component Description

When Air conditioning is on, A/C switch transmit the battery voltage signal to ECM. After the signal that A/C is switched on is inputted, the ECM drive electronic throttle raises the engine idle speed, and corrects the ignition advance angle. Meanwhile ECM controls the operation of A/C relay to make the compressor electromagnetic clutch operate.

2、Components Inspection

When the engine is idling, use the fault diagnostic apparatus to check whether the air conditioning switch operates well

A/C switch checklist

Check items	A/C switch	Normal instructions
A/C switch	Off	Off
	On	On
A/C compressor	Off	Off(compressor clutch does not work)
	On	On(compressor clutch works)

Continuously Variable Cam Phase Regulator and its Control Valve

1、Component Description

Continuously Variable cam phase regulator is used for changing the timing of valve mechanism. It can continuously adjust the phase relationships between camshaft and crankshaft according to the system requirements to achieve the control of timing phase.

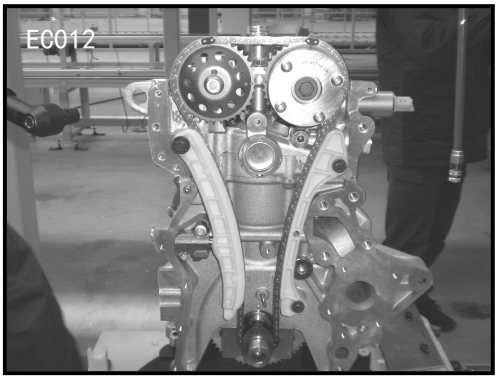
VVT pressure regulating valve is a four path pulse-width control solenoid valve with two-way movement, it can achieve the oil flow control through the axial movement of plunger valve. According to the duty cycle signal of the adjustable pulse-width , Engine ECU changes the oil flow leading to both sides of the rotor blades, so as to control the cam timing and phases that relative to crankshaft .

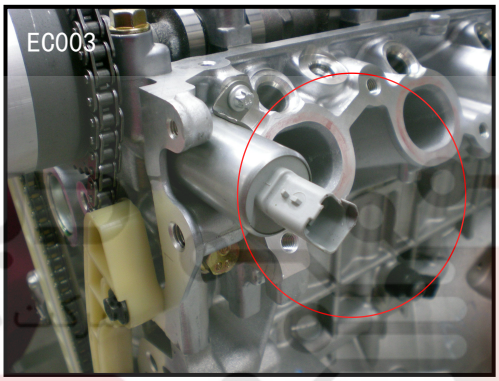
Main functions of the system：

- Improve the intake efficiency:
- Improve dilution control to get better fuel economy when there is partial load.
- Being as an alternative to Exhaust Gas Recirculation (EGR) system with the ability to reduce equivalent amount and NOx emission, it also has the potential to reduce HC emissions and heat radiation;
- The use of the default variable cam phase system return helps improve the

cold start performance and reduce HC emission.

2、Installation Positions of Components





3、Component Circuit Diagram

Terminal 1 (control signal): ECU (48# pin) provides a control signal.

Terminal 2: main relay control.

4、Trouble Diagnosis

Diagnostic system is one of the most complex parts of the Cam Phase Adjust control system. The cam sensor, target wheel and oil control valve must be possessed with a component-level diagnostic capabilities and must constantly confirm the integrity of cam signal to ensure the cam phase measurement. The drive signal of oil control valve needs a check as well as the fuel injection nozzles and ignition coil driver. But for the oil control valve and the phaser, usually there is more responsible diagnosis. The phase regulator and oil control valve circuit are detected by ECU for the following problems:

- Slow response of the air intake VCP phase.
- Phase error of the air intake VCP camshaft.
- The air intake VCP and cam teeth learning are out of range.
- The air intake VCP hydraulic control valve is clamped.

5、Troubleshooting

- Check whether there is a short circuit or open circuit of sensor signal.
- Check whether there are crossed lines between the harness.
- Check whether there is a short circuit between the sensor line and the power.
- Check whether there is a blockage or good ventilation inside the VCP and oil control valve.
- Check VCP working conditions as follows:

Items	Value
Input voltage	11.5 - 18.0 VDC; nominal 13.5 ±1.0 VDC
The average working current when remain in position *	1.0 AMP
The maximum current	Duty cycle when 100%, 2.5 AMP when - 40ºC,15.5V
Ambient temperature	-40ºC to 150ºC
Under-the-hood temperature	-40ºC to 150ºC
Solenoid valve temperature	-10ºC to 150ºC

- Check the oil control valve working conditions as follows:

Type	Oil control solenoid valve
Coil impedance	Nominal: 7.0 Ω@20 ºC 5.6Ω@-30 ºC 10.6 Ω@150 ºC
Coil inductance	18mH@1KHz
The minimum current for complete route of plunger valve	1.07 AMP
Input voltage(by coil)	Nominal: 13 ± 0.5V Minimum: 11.0V Maximum: 18.0 volts (CARB requirements)
Start the response in normal	<50ms in T_{coil} <65ºC

input voltage	
Turn off the response	<50ms in T_{coil} <65℃

6、Removal and Installation

Please refer to the "timing chain wheel system”

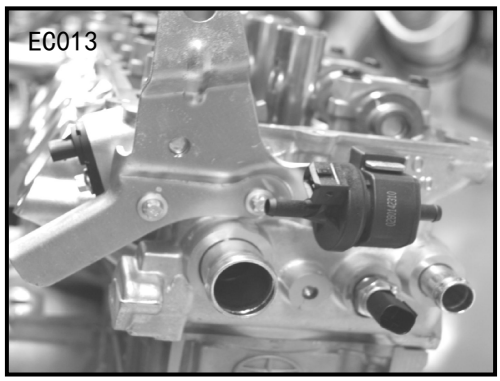
Canister solenoid valve

1、Component Description

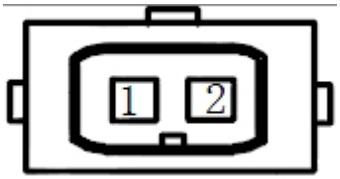
Control the cleaning air flow from the canister to the intake manifold. Because the canister has a limited adsorbing capacity, if gasoline volatilizes to the outside, it will cause atmospheric pollution and add additional insecurity factors.

Inside the canister solenoid valve is a solenoid valve structure whose opening control is determined by the digital control square pulse outputted by ECU .The canister solenoid valve opening varies according to the different engine working conditions.To ensure the output of engine power when there is heavy engine load and idling, the canister solenoid valve refuses to work.

2、Installation Positions of Components



3、Terminal Definition



Terminal 1: main relay output end.

Terminal2 (control signal): ECU (46# pin)

provides a control signal.

4、Trouble Diagnosis

- Short circuit between sensor line and ground
- Short circuit between sensor line and power supply
- Open circuit of sensor line

5、Troubleshooting

- Check whether there is a short circuit or open circuit of sensor signal.
- Check whether there are crossed lines between the harnesses.
- Check whether there is a short circuit between the sensor line and the power.
- Check whether there is a blockage or good ventilation inside the canister control solenoid valve.
- Operating temperature: -40～120℃;
- Coil resistance: 20.5±1.5Ω（20℃）;
  Working voltage：8～16V;
- Rated operational voltage：12V.

6、Removal and installation

1) Removal

① Disconnect the horse at the side of canister solenoid valve.

② Disconnect the canister solenoid valve harness connector.

③ Take off canister solenoid valve from its holder.

2）Installation

Please note the followings and install in the reverse order of removal.

■When installing, ensure that the air flow direction is within the specification and check whether canister solenoid valve has wears or cracks.

■During removal and installation, avoid entry of such fluids as water and oil into the valve.

Ignition coil

1、Component Description

Ignition Coil transforms the low voltage of primary winding into the high voltage

of the secondary winding, and the spark plugs discharge sparks to ignite the fuel air mixture in the cylinder.

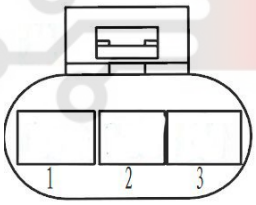
- Ignition Coil Voltage Range:6～16V
- Ignition Coil secondary resistance: 8.7±0.87 KΩ

2、Installation Positions of Components

Installed on the top of the cylinder head cover

3、Terminal Definition

Terminal 1 (control signal): ECU (NO.1 cylinder corresponds to 27# pin, NO.2 cylinder corresponds to 6# pin, NO.3 cylinder corresponds to 7#pin, NO.4 cylinder corresponds to 47# pin) transmits control signal;



Terminal 2 (power supply): main relay control;

Terminal 3 (grounded): engine grounded.

4、Trouble Diagnosis

As ECU does not have a function of fault diagnosis on ignition coils, if the ignition coil has any fault, ECU would output no trouble codes. Only by checking the ignition coil resistance can determine whether the ignition coil is working properly.Under normal circumstances,the heat given by working ignition coil is relatively large,which will lead to increasing resistance value of ignition coil.As a result, the faults like unsteady engine operation and auto shut-off may occur. However, the control line of the ignition coil can be monitored by ECU. When ECU detects an ignition coil fault, it will turn off the injector that corresponding to the cylinder.

- Short circuit between control lines and ground.
- Short circuit between control lines and power supply circuit.
- Open circuit of control line.

5、Trouble Diagnosis

- Short Circuit and/or Broken Circuit inside coil
- Coil leakage and shell cracks;
- Aging coil causes inadequate ignition energy.

5、Removal and installation

Refer to “Ignition System” for removal and installation.

Electric Fuel Pump

1、Component Description

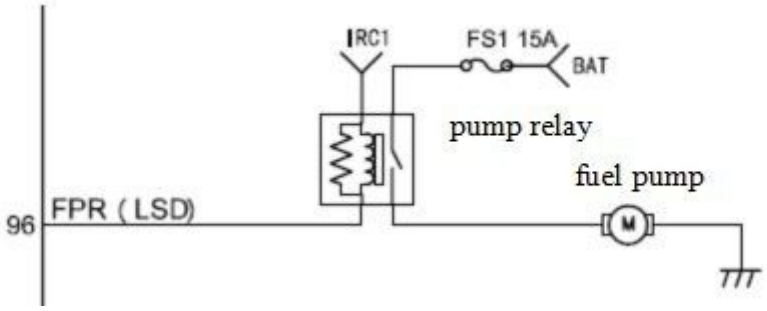
The fuel is delivered from the fuel tank to the engine fuel manifold in terms of a certain oil pressure and flow, and a stable oil pressure is maintained (by the pressure regulator).

2、Installation Positions of Components

They are installed inside the fuel tank.

3、Component circuit diagram

Pin description: electric fuel pump has two pins, beside which is the fuel pump housing carved with a “+" and " -" sign, which respectively means the positive (pump relay) and ground connection.



4、Components Inspection:

1) Check the internal resistance of the fuel pump.

The internal resistance is not zero or infinite.

2) Check the fuel pressure.

Please refer to "Fuel System".

5、Removal and Installation

Please refer to "Fuel Pump Assembly" section.

***Note*:**

■In order to prevent the fuel pump accidental damage, please do not operate in oil-free status.

■If fuel pump needs to be replaced, please note that rinse the fuel tank and fuel lines and replace the fuel filter.

Engine Electronic Control Module （ECM）

1、System Description

M (E) 7 system is the EMS system that based on engine theoretical model:

- Air Inflation Calculation Model: through the residual exhaust sub-model, the exhaust back pressure sub-models and intake air temperature sub-models, it can accurately calculate the actual mass of intake air of each cycle, which serves as a basis for torque control and fuel injection calculation.

- Load forecast model: based on gradient changes of the intake manifold pressure, it can calculate the actual mass of intake air in a circle which serves as a basis for oil film calculation in dynamic working conditions before fuel injection,

- Torque Calculation Model: It is a torque model that is based on a real-time test

and consists of ignition timing and fuel-air ratio changes, and it is a main line running through this system.

- Temperature Protection Model: It is a exhaust temperature model that is based on a real-time test and consists of fuel-air ratio changes, ignition timing and the influence of ambient temperature changes. It is able to achieve a better balance between catalytic converters protection and fuel consumption.

1) Function

- Main power supply relay control of fully built unit car
- Speed and density of air flow
- Closed-loop control of multi-point sequential fuel injection (including MAP CID pressure to judge cylinders)
- Closed-loop control of multi-point sequential fuel injection
- Different ways of fuel supply such as fuel return, no fuel return , half fuel return and so on
- Fuel Pump Operation Control
- Direct ignition without distributor and ECU built-in ignition module with sequential ignition order of 4 cylinders
- Use Electronic Throttle to control the quick response and accuracy of the air intake flow and use ECU to achieve torque control and improve reliability
- VVT - I (Electronically controlled air intake phase variable Cam Control Unit) controls the engine air intake charge, torque and increases power
- Knock control
- Canister solenoid valve control
- Air-conditioning and cooling water tank fan control
- Mileage memory
- Over voltage protection
- Electron security
- CAN - BUS communication interface can communicates with automatic transmission control module or ABS system
- Open and modular C language programming and so

2) ECM Pin Definition:

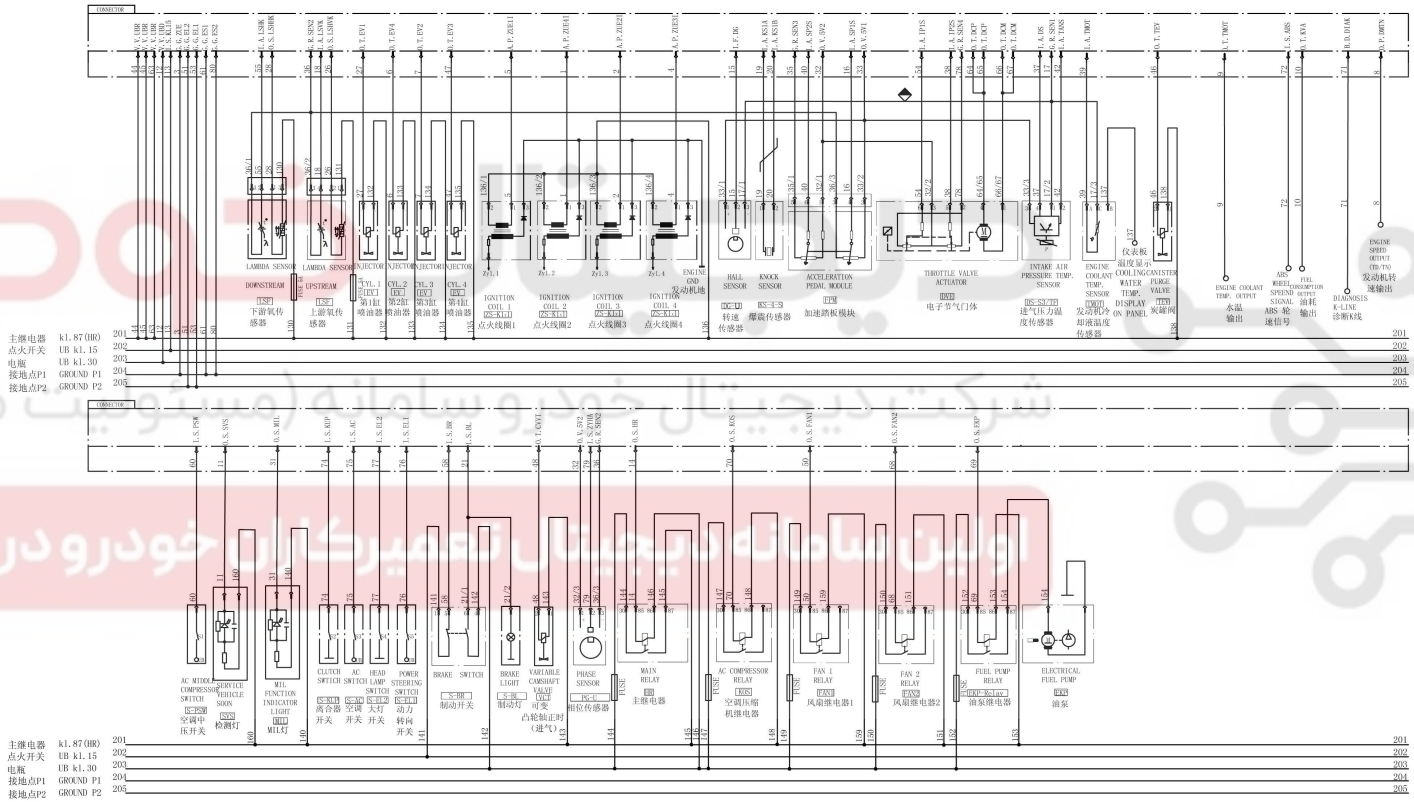
ECM pin Definition Table

Pin	Function	Pin	Function
1	Ignition coil （NO.2 cylinder）	12	UPS
2	Ignition coil （NO.3cylinder）	13	Ignition switch
3	Ignition	14	Main relay
4	Ignition coil （NO.4cylinder）	15	Engine speed sensor
5	Ignition coil （NO.1cylinder）	16	Accelerator pedal sensor
6	Fuel injector 4 (No. 2 cylinder)	17	Sensor 1
7	Fuel injector 4 (No. 3 cylinder)	18	Upstream Oxygen sensor
8	Engine speed output	19	Knock sensor terminal A
9	Water temperature output	20	Knock sensor terminal A
10	Fuel consumption output	21	Brake light
11	SVS light	22	
23		62	
24		63	Non-continuous power supply
25		64	Throttle actuator
26	Upstream Oxygen sensor heating	65	Throttle actuator
27	Fuel injector 1 (No. 1 cylinder)	66	Throttle actuator
28	Downstream Oxygen sensor heating	67	Throttle actuator
29		68	Fan Control 2
30		69	Fuel pump relay
31	MIL light	70	A/C compressor relay
32	5V power supply 2	71	Diagnostic K-line
33	5V power supply 1	72	High Knock sensor
34		73	
35	Sensor 3	74	Clutch Switch
36	Sensor 2	75	A/C switch
37	Intake air pressure sensor	76	Power steering switch
38	Throttle position sensor 2	77	Headlight switch
39	Engine coolant temperature sensor	78	Sensor 4
40	Accelerator pedal sensor	79	Phase sensor
41		80	Power
42	Intake air temperature sensor	81	
43			
44	Non-continuous power supply		
45	Non-continuous power supply		
46	Carbon tank valve		
47	Fuel injector 3 (No. 4 cylinder)		
48	Variable camshaft timing (intake air)		
49			

50	Fan Control 1		
51	Electronic 2		
52			
53	Electronic 1		
54	Throttle position sensor 1		
55	Downstream Oxygen sensor		
56			
57			
58	Brake switch		
59			
60	A/C medium voltage switch		
61	Power 1		

* Specific pin numbers are subject to harnesses schematic. (Spare terminal definition means "NC".)

3) Electrical Schematic



4、Components Inspection

1) Read the engine failure based on the engine data from K-line.

2) Check whether ECM connection line is intact, with a focus on whether the ECM power supply and ground line is normal.

3) Check whether the external sensor is working properly, the outputted signal is credible and whether its line is intact.

4) Check whether the actuator is working properly and whether its line is intact.

5) Finally replace ECM and carry out experiment.

6、Removal and Installation

1) Removal

① Turn the ignition switch to "OFF" position, and remove the battery negative terminal.

② Remove the bottom parts of instrument panel. Please refer to the “Instrument Panel".

③ Disconnect the ECM port harness connector. Please refer to the "Precautions".

④ Remove bolt securing ECM and remove ECM.

2） Installation

■Install in the reverse order of removal

■As the installation precautions, please refer to the "Precautions"

Engine Control System Trouble Diagnosis Flow

Diagnosing according to DTCs

1, Descriptions

1) Operate the following servicing only when confirm it is a current steady fault, otherwise it may result in diagnostic errors.

2) It is forbidden to check electronic control system lines with an analog multimeter, the “multimeter” mentioned hereunder refers to a digital multimeter.

3) When servicing a vehicle with anti-theft system, if“Replace ECU” appears in “Next step” column, please pay attention to ECU programming after replacement

4) If a DTC indicates too low voltage in a circuit, it means that short/open to ground may exist in the circuit; If a DTC indicates too high voltage in a circuit, it means that short to power may exist in the circuit; if a DTC indicates a circuit fault, it means that open or several kinds of improper wiring may exist in the circuit.

2, Seek for diagnosis help

1) A DTC can not be cleared is a steady fault; in the case of an incidental fault, check harness connector for looseness carefully.

2) Inspection has been made with the above procedure. No abnormality is found.

3) During servicing, do not overlook the effects of maintenance condition, cylinder pressure, and mechanical ignition timing of the vehicle to the system.

4) Replace the old ECU with new one and test.

■If the DTC can be cleared, and then the fault is located in the ECU; if the DTC still can not be cleared, change back with the old ECU and repeat the flow to operate another servicing.

3, Diagnose DTCs

■All related ECU pins mentioned hereunder are subject to actual wiring diagrams.

DTC	P0010	VVT Intake Control Valve Circuit Fault			
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears			
Terminals:		ME7		VCP control	Normal Measurement signal
Variable timing control signal.		E48		1	0～1000mV
Main relay:		143		2	12V
Possible source of trouble			Reference troubleshooting solutions		
1. Poor connection of Connector 2. Open of circuit of variable timing control signal 3. Short to ground of variable timing control signal circuit 4. Improper wiring of main relay 5.Sensor damage 6. Timing control signal input interface failure of ECM			1. Re-connect 2. Repair harness 3. Repair harness 4. Repair harness 5. Replace Sensor 6. Replace ECM		

DTC	P0016	The installation position of camshaft and crankshaft is improper
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears torque limitation
Possible source of trouble		Please refer to troubleshooting solutions
1. Mechanical timing errors (timing errors, chain skip gear or chain elongation) 2. ECM failure		1. Check Timing and Chain 2. Replace ECM

DTC	P0030	Upstream oxygen sensor heater control circuit open		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears turn off heater		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Main relay:		131	1	12V
Heating control signal:		E26	2	Low-voltage
Possible source of trouble			Please refer to troubleshooting solutions	
1, An open exists between the circuit connected to ECU pin and 2# pin of upstream oxygen sensor. 2, The circuit connecting 1# pin of upstream oxygen sensor to main relay open. 3, Circuit between 1# and 2# pins of upstream oxygen sensor open.			1. Measure Resistance and repair wiring harness 2. Measure Resistance and repair wiring harness Replace the Oxygen sensor.	

DTC	P0031	The voltage of upstream oxygen sensor heating control circuit is too low		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears turn off heater		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Main relay:		131	1	12V
Heating control signal:		E26	2	Low-voltage
Possible source of trouble			Please refer to troubleshooting solutions	
1,The circuit connecting 2# pin of upstream oxygen sensor to pins of ECU is short to ground			1,The circuit connecting 2# pin of upstream oxygen sensor to pins of ECU is open to ground Note: It may be an intermittent fault	

DTC	P0032	The voltage of upstream oxygen sensor heating control circuit is too high		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears turn off heater		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Main relay:		131	1	12V
Heating control signal:		E26	2	Low-voltage
Possible source of trouble			Please refer to troubleshooting solutions	
1,The circuit connecting 2# pin of upstream oxygen sensor to pins of ECU is short to power source 2. The circuit connecting ECU pins and 1# line short			1. Measure the voltage of 2# pin 2. Measure resistance between ECU pins and 1# pin of sensor Note: It may be an intermittent fault	

DTC	P0036	Downstream oxygen sensor heating control circuit open		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears turn off heater		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Main relay:		130	1	12V
Heating control signal:		E28	2	Low-voltage
Possible source of trouble			Please refer to troubleshooting solutions	
1, An open exists between the circuit connected to ECU pin and 2# pin of upstream oxygen sensor. 2, The circuit connecting 1# pin of upstream oxygen sensor to main relay open. 3, Circuit between 1# and 2# pins of upstream oxygen sensor open.			1. Measure Resistance and repair wiring harness 2. Measure Resistance and repair wiring harness Replace the Oxygen sensor.	

DTC	P0037	The voltage of downstream oxygen sensor heating control circuit is too low		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears turn off heater		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Main relay:		130	1	12V
Heating control signal:		E28	2	Low-voltage
Possible source of trouble			Please refer to troubleshooting solutions	
1,The circuit connecting 2# pin of upstream oxygen sensor to pins of ECU is short to ground			1,The circuit connecting 2# pin of upstream oxygen sensor to pins of ECU is open to ground Note: It may be an intermittent fault	

DTC	P0038	The voltage of upstream oxygen sensor heating control circuit is too high		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears turn off heater		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Main relay:		130	1	12V
Heating control signal:		E28	2	Low-voltage
Possible source of trouble			Please refer to troubleshooting solutions	
1,The circuit connecting 2# pin of upstream oxygen sensor to pins of ECU is short to power source 2. The circuit connecting ECU pins and 1# line short			1. Measure the voltage of 2# pin 2. Measure resistance between ECU pins and 1# pin of sensor Note: It may be an intermittent fault	

DTC	P0053	Upstream oxygen sensor internal heating resistance improper		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears turn off heater		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Main relay:		131	1	12V
Heating control signal:		E26	2	Low-voltage
Possible source of trouble			Please refer to troubleshooting solutions	
1,Oxygen sensor heating resistance is abnormal,function is disabled.			1,Replace the Oxygen sensor.	

DTC	P0054	Downstream oxygen sensor internal heating resistance improper		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears turn off heater		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Main relay:		130	1	12V
Heating control signal:		E28	2	Low-voltage
Possible source of trouble			Please refer to troubleshooting solutions	
1, Oxygen sensor heating resistance is abnormal, function is disabled.			1, Replace the Oxygen sensor.	

DTC	P0105	IAP sensor signal unchanged		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears turn off heater		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Power-supply wire:		E33	3	5V
Ground wire:		E17	1	0V
Signal wire.		E37	4	0～5V
Possible source of trouble			Please refer to troubleshooting solutions	
1,IAP sensor frozen or clogged 2,IAP sensor serious aging			1. Re-install the sensor at normal room temperature after the ice in the sensor melted or clearing the carbon fuel on surface, please replace the sensor if faults cannot be eliminated 2. Replace the intake air pressure sensor	

DTC	P0106	IAP sensor signal improper		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Power-supply wire:		E33	3	5V
Ground wire:		E17	1	0V
Signal wire.		E37	4	0～5V
Possible source of trouble			Please refer to troubleshooting solutions	
1,The components of IAP sensor leaks air 2． Pressure sensor damaged 3． Installation position of the sensor leaks air 4． Migration characteristics of the pressure sensor			1. Re-install the intake air pressure sensor, repair air leakage of junctions of air intake pipes 2, Replace the intake air pressure sensor	

DTC	P0107	The signal voltage of IAT sensor is too low		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Power-supply wire:		E33	3	5V
Ground wire:		E17	1	0V
Signal wire.		E37	4	0～5V

Possible source of trouble	Please refer to troubleshooting solutions
1. Poor connection of Connector 2. Harness pressure signal circuit open 3. Harness pressure signal circuit short to ground 4. 5V reference voltage circuit break 5. Sensor signal ground circuit break 6. Harness 5V reference voltage reverses to reference ground harness(This failure may result in damage of sensor) 7. Sensor damage 8. MAP signal input interface on ECM failure	1. Re-connect 2. Repair harness 3. Repair harness 4. Repair harness 5. Repair harness 6. Repair harness 7. Replace sensor. 8. Replace ECM

DTC	P0108	The signal voltage of IAT sensor is too high		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Power-supply wire:		E33	3	5V
Ground wire:		E17	1	0V
Signal wire.		E37	4	0～5V

Possible source of trouble	Please refer to troubleshooting solutions
1. Pressure signal circuit short to 5 V reference voltage or power positive. 2.Sensor damage 3. Pressure signal input interface failure on ECM	1. Repair harness 2. Replace sensor 3. Replace ECM

DTC	P0112	The voltage of intake air temperature sensor is low		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Power-supply wire:		E33	3	5V
Ground wire:		E17	1	0V
Signal wire.		E42	2	0～5V
Possible source of trouble			Please refer to troubleshooting solutions	
1.Poor connection of Connector 2.Temperature signal circuit open 3. Sensor signal ground circuit open 4.Temperature signal circuit short to ground 5. Sensor damage 6. ECM Signal input interface failure			1. Re-connect 2. Repair harness 3. Repair harness 4. Repair harness 5. Replace sensor. 6. Replace ECM	

DTC	P0113	The voltage of intake air temperature sensor is high		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears intake air temperature equals to the coolant temperature, but not more than 44.25 degree.		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
Power-supply wire:		E33	3	5V
Ground wire:		E17	1	0V
Signal wire.		E42	2	0～5V
Possible source of trouble			Please refer to troubleshooting solutions	
1. Temperature signal circuit short to ground 2. Sensor damage 3. ECM Signal input interface failure			1. Repair harness 2. Replace sensor. 3. Replace ECM	

DTC	P0117	The voltage of coolant temperature sensor is low		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears apply the intake air temperature when start, fix it when the temperature increase to 79.5 degrees with time going by		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
ECU signal wire:		E39	A	0.5～4.5V
ECU ground wire.		E17	B	0V
Instrument signal wire:		Instrument	c	
Possible source of trouble			Please refer to troubleshooting solutions	
1.Poor connection of Connector 2. Temperature signal circuit open 3. Sensor signal ground circuit open 4.Sensor damage			1. Re-connect 2. Repair harness 3. Repair harness 4. Replace sensor.	

DTC	P0118	The voltage of coolant temperature sensor is high		
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears apply the intake air temperature when start, fix it when the temperature increase to 79.5 degrees with time going by		
Terminals:		ME7	Pins of Sensor	Normal Measurement signal
ECU signal wire:		E39	A	0.5～4.5V
ECU ground wire.		E17	B	0V
Instrument signal wire:		Instrument	c	
Possible source of trouble			Please refer to troubleshooting solutions	
1.Temperature signal circuit short to power positive 2.Sensor damage			1. Repair harness 2. Replace sensor.	

DTC	P0121	Electronic throttle sensor signal 1 is improper (signal voltage is out of the normal range)	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappear ECM cut throttle actuator current, and the return valve back to 6 degrees of throttle position though spring. And then, according to opening of the accelerator pedal, ECM adjust the engine power output through control of fuel injection (intermittent fuel shut off) and ignition timing, to allow vehicles to continue to maintain a minimum speed.	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor ground	E78	2	0V
Sensor power	E32	3	5V
Sensor 1 signal	E54	6	0.65～-4.65V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Throttle seizure 2.Throttle body damage 3.Signal circuit open 4.Position sensor damage		1. Replace throttle 2. Replace throttle 3. Repair harness and terminals 4. Replace throttle	

DTC	P0122	The voltage of electronic throttle sensor signal 1 is too low	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappear ECM cut throttle actuator current, and the return valve back to 6 degrees of throttle position though spring. And then, according to opening of the accelerator pedal, ECM adjust the engine power output through control of fuel injection (intermittent fuel shut off) and ignition timing, to allow vehicles to continue to maintain a minimum speed.	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor ground	E78	2	0V
Sensor power	E32	3	5V
Sensor 1 signal	E54	6	0.65～-4.65V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Sensor harness circuit open or short to ground 2.Position sensor damage 3. Sensor signal circuit open		1. Reconnect the sensor or repair harness 2. Replace throttle 3. Check the power voltage circuit for open Repair or replace throttle	

DTC	P0123	The voltage of electronic throttle sensor signal 1 is too high	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappear ECM cut throttle actuator current, and the return valve back to 6 degrees of throttle position though spring. And then, according to opening of the accelerator pedal, ECM adjust the engine power output through control of fuel injection (intermittent fuel shut off) and ignition timing, to allow vehicles to continue to maintain a minimum speed.	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor ground	E78	2	0V
Sensor power supply	E32	3	5V
Sensor 1 signal	E54	6	0.65～-4.65V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Sensor harness short to power 2. Sensor harness short to power source 3.Position sensor damage		1. Reconnect the sensor or repair harness 2. Repair harness 3. Replace sensor	

DTC	P0130	Upstream oxygen sensor signal improper	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears System stops controlling the oxygen signal closed-loop	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	3	/
Signal positive	E18	4	0～1V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Upstream oxygen sensor signal continuously in the lower range (0.1 - 0.4) V, but Downstream oxygen sensor signal continuously above 0.5V 2. Upstream oxygen sensor signal continuously in the lower range (0.5 - 0.4) V, but Downstream oxygen sensor signal under 0.1V Upstream oxygen sensor signal circuit and heater circuit are coupled		1. Reconnect the sensor or repair harness 2. Check the air-fuel ratio, after troubleshooting, replace oxygen sensor 3. Repair harness	

DTC	P0131	The voltage of upstream oxygen sensor signal is low	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	3	/
Signal positive	E18	4	0～1V
Possible source of trouble		Please refer to troubleshooting solutions	
The voltage of upstream oxygen sensor signal is negative 1. Oxygen Sensor is contaminated by water, fuel or other materials 2. Signal wire ground.		1. Check and repair fuel problems or Replace oxygen sensor 2. Repair harness	

DTC	P0132	The voltage of upstream oxygen sensor signal is high	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears System stops controlling the oxygen signal closed-loop	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	3	/
Signal positive	E18	4	0～1V
Possible source of trouble		Please refer to troubleshooting solutions	
The voltage of upstream oxygen sensor signal is bigger than 1.5V 1. Circuit short to the heating power 2. Circuit short to the power		1. Repair harness 2. Repair harness	

DTC	P0133	Upstream oxygen sensor aging (hop frequency is too small)	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears System stops controlling the oxygen signal closed-loop	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	3	/
Signal positive	E18	4	0～1V
Possible source of trouble		Please refer to troubleshooting solutions	
Upstream oxygen sensor aging, oxygen signal hop frequency is smaller than critical limits.		Check and repair fuel problems and Replace oxygen sensor	

DTC	P0134	Upstream oxygen sensor circuit malfunction (open)	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears System stops controlling the oxygen signal closed-loop	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	3	/
Signal positive	E18	4	0～1V
Possible source of trouble		Please refer to troubleshooting solutions	
Upstream oxygen sensor signal always change within 0.4 - 0.6 V system determines the circuit open 1. Signal to ECU circuit open 2. Poor connection of connector, pin oxidation		1. Repair harness 2. Repair connector	

DTC	P0136	Downstream oxygen sensor signal improper	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	4	/
Signal positive	E55	2	0～1V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Upstream oxygen sensor signal circuit and heater circuit are coupled		1. Repair harness	

DTC	P0137	The voltage of downstream oxygen sensor signal is low	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	4	/
Signal positive	E55	2	0～1V
Possible source of trouble		Please refer to troubleshooting solutions	
The voltage of downstream oxygen sensor signal is negative 1.Oxygen Sensor is contaminated by water, fuel or other materials 2.Signal wire ground.		1. Check and repair fuel problems or Replace oxygen sensor 2. Repair harness	

DTC	P0138	The voltage of downstream oxygen sensor signal is high	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	4	/
Signal positive	E55	2	0～1V
Possible source of trouble		Please refer to troubleshooting solutions	
The voltage of downstream oxygen sensor signal is bigger than 1.5V 1. Circuit short to the heating power Circuit short to the power		1. Repair harness 2. Repair harness	

DTC	P0140	Downstream oxygen sensor circuit malfunction (open)	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears System stops controlling the oxygen signal closed-loop	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	4	/
Signal positive	E55	2	0～1V
Possible source of trouble		Please refer to troubleshooting solutions	
Downstream oxygen sensor signal always change within 0.4 - 0.6 V system determines the circuit open 1.Signal to ECU circuit open 2.Poor connection of connector, pin oxidation		1.Repair harness 2.Repair connector	

DTC	P0201	Control circuit of fuel injector in No. 1 cylinder malfunction	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E27	2	1～10V
Main relay	132	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Control circuit of fuel injector open 2. Fuel injector connector to the main relay circuit open 3.Fuel injector coil open		1. Repair harness 2. Repair harness 3. Replace fuel injector	

DTC	P0202	Control circuit of fuel injector in No.2 cylinder malfunction	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E06	2	1～10V
Main relay	133	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit of fuel injector open 2.Fuel injector connector to the main relay circuit open 3.Fuel injector coil open		1. Repair harness 2. Repair harness 3. Replace fuel injector	

DTC	P0203	Control circuit of fuel injector in No.3 cylinder malfunction	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E07	2	1～10V
Main relay	134	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Control circuit of fuel injector open 2. Fuel injector connector to the main relay circuit open 3.Fuel injector coil open		1. Repair harness 2. Repair harness 3. Replace fuel injector	

DTC	P0204	Control circuit of fuel injector in No.4 cylinder malfunction	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E46	2	1～10V
Main relay	135	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit of fuel injector open 2.Fuel injector connector to the main relay circuit open 3.Fuel injector coil open		1. Repair harness 2. Repair harness 3. Replace fuel injector	

DTC	P0221	Electronic throttle sensor signal 2 is improper (signal voltage is out of the normal range)	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappear ECM cut throttle actuator current, and the return valve back to 6 degrees of throttle position though spring. And then, according to opening of the accelerator pedal, ECM adjust the engine power output through control of fuel injection (intermittent fuel shut off) and ignition timing, to allow vehicles to continue to maintain a minimum speed.	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor ground	E78	2	0V
Sensor power supply	E32	3	5V
Sensor 2 signal	E38	6	0.65～-4.65V
Possible source of trouble		Please refer to troubleshooting solutions	
Throttle2 signal bigger than 4.65 V 1.Throttle seizure 2.Throttle body damage 3.Signal circuit open 4.Position sensor damage		1. Replace throttle 2. Replace throttle 3. Repair harness and terminals 4. Replace throttle	

DTC	P0222	The voltage of electronic throttle sensor signal 2 is too low	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappear ECM cut throttle actuator current, and the return valve back to 6 degrees of throttle position though spring. And then, according to opening of the accelerator pedal, ECM adjust the engine power output through control of fuel injection (intermittent fuel shut off) and ignition timing, to allow vehicles to continue to maintain a minimum speed.	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor power supply	E32	3	5V
Sensor ground	E78	2	0V
Sensor 1 signal	E38	6	0.65～-4.65V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Sensor harness circuit open or short to ground 2.Position sensor damage 3. Sensor signal circuit open		1. Reconnect the sensor or repair harness 2. Replace throttle 3. Check the power voltage circuit for open Repair or replace throttle	

DTC	P0223	The voltage of electronic throttle sensor signal 2 is too high	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappear ECM cut throttle actuator current, and the return valve back to 6 degrees of throttle position though spring. And then, according to opening of the accelerator pedal, ECM adjust the engine power output through control of fuel injection (intermittent fuel shut off) and ignition timing, to allow vehicles to continue to maintain a minimum speed.	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor ground	E78	2	0V
Sensor power	E32	3	5V
Sensor 1 signal	E38	6	0.65～-4.65V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Sensor harness short to power 2. Sensor harness short to power source 3.Position sensor damage		1. Reconnect the sensor or repair harness 2. Repair harness 3. Replace sensor	

DTC	P0261	Control circuit of fuel injector in No. 1 cylinder is too low	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E27	2	1～10V
Main relay	132	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Control circuit of fuel injector short tp ground		1. Repair harness	

DTC	P0262	Control circuit of fuel injector in No. 1 cylinder is too high	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E27	2	1～10V
Main relay	132	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1． Control circuit of fuel injector short to power		1. Repair harness	

DTC	P0264	Control circuit of fuel injector in No.2 cylinder is too low	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E06	2	1～10V
Main relay	133	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit of fuel injector short to ground		1. Repair harness	

DTC	P0265	Control circuit of fuel injector in No.2 cylinder is too high	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E06	2	1～10V
Main relay	133	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit of fuel injector short to power		1. Repair harness	

DTC	P0267	Control circuit of fuel injector in No.3 cylinder is low	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E07	2	1～10V
Main relay	134	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
Control circuit of fuel injector short tp ground		Repair harness	

DTC	P0268	Control circuit of fuel injector in No.3 cylinder is high	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E07	2	1～10V
Main relay	134	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
Control circuit of fuel injector short to power		Repair harness	

DTC	P0270	Control circuit of fuel injector in No.4 cylinder is low	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E46	2	1～10V
Main relay	135	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit of fuel injector open to ground		1. Repair harness	

DTC	P0271	Control circuit of fuel injector in No.4 cylinder is high	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Control wire	E46	2	1～10V
Main relay	135	1	12V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit of fuel injector open to power		1. Repair harness	

DTC	P0300	Several cylinder misfire occurred
	P0301	One cylinder misfire occurred
	P0302	Two cylinder misfire occurred
	P0303	Three cylinder misfire occurred
	P0304	Four cylinder misfire occurred
Set up emergency control programs.		light or flash malfunction indicator light Power Limited or normal
Possible source of trouble		Please refer to troubleshooting solutions
1. Crankshaft camshaft timing failure 2. Ignition fuel injection system failure 3. EVAP system failure 4. Basic mechanical or cylinder pressure abnormal		1. Re-install crankshaft and camshaft signal or repair 2. Repair ignition fuel injection system failure 3. Repair EVAP failure 4. Repair the air intake system failure

DTC	P0321	Crankshaft TDC on the gear signal improper	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power-supply wire	E33	1	5V
Signal wire	E15	2	0～-5V
Ground wire	E17	3	0V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Circuit intermittent open 2. Crankshaft signal deviation 3. Sensor installed aslant		1.Repair harness 2. Repair signal failure 3. Re-install sensor	

DTC	P0322	Speed sensor signal failure	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power-supply wire	E33	1	5V
Signal wire	E15	2	0～-5V
Ground wire	E17	3	0V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Coil open 2. Signal wire to ECU circuit open 3. Signal wire to ECU circuit short		1. Replace sensor 2.Repair harness 3.Repair harness	

DTC	P0327	The voltage of KS signal circuit voltage is too low	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears Close knock closed-loop control, the ignition advance is in the default value	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal A	E19	1	0～-1V
Signal B	E20	2	/
Possible source of trouble		Please refer to troubleshooting solutions	
1. Coil open 2. Circuit open 3. Circuit short to low-voltage		1. Replace sensor 2.Repair harness 3.Repair harness	

DTC	P0328	The voltage of KS signal circuit voltage is too high	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears Close knock closed-loop control, the ignition advance is in the default value	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal A	E19	1	0～-1V
Signal B	E20	2	/
Possible source of trouble		Please refer to troubleshooting solutions	
Coil short to power or high-voltage 2. Internal mechanical loose vibration failure		1.Repair harness 2 Repair mechanical failures	

DTC	P0340	Phase sensor improperly installed	
Set up emergency control programs.		Light on malfunction indicator light torque limits	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	E32	1	5V
ground	E36	3	0V
Signal	E79	2	0-5V square wave
Possible source of trouble		Please refer to troubleshooting solutions	
1.Phase sensor improperly installed 2.Poor connection of connector		1.Correct the installation 2.Repair connector	

DTC	P0341	Phase sensor signal improper	
Set up emergency control programs.		Light on malfunction indicator light torque limits	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	E32	1	5V
ground	E36	3	0V
Signal	E79	2	0-5V square wave
Possible source of trouble		Please refer to troubleshooting solutions	
1.Phase position between crankshaft and camshaft improper		1. Repair OCV valve failure 2. Repair VCP actuator failure 3. Repair mechanical timing failure	

DTC	P0342	The voltage phase sensor is too low	
Set up emergency control programs.		Light on malfunction indicator light torque limits	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	E32	1	5V
ground	E36	3	0V
Signal	E79	2	0-5V square wave
Possible source of trouble		Please refer to troubleshooting solutions	
1. Signal wire short to ground		1.Repair harness and connector	

DTC	P0343	The voltage phase sensor is too high	
Set up emergency control programs.		Light on malfunction indicator light torque limits	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	E32	1	5V
ground	E36	3	0V
Signal	E79	2	0-5V square wave
Possible source of trouble		Please refer to troubleshooting solutions	
1. Signal wire short to power 2. power-supply wire short to power		1.Repair harness and connector 2.Repair harness	

DTC	P0420	TWC oxygen storage capacity deterioration
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
Downstream oxygen sensor change frequency and amplitude exceeds the limits 1.Please use leaded gasoline 2.Oxygen sensor failure 3.Fuel pressure is too high 4.Misfire fault 5.Catalytic converter fault		1. Replace fuel. 2. Repair oxygen sensor circuit failure, then replace oxygen Sensor 3. Remove fuel pressure fault 4. Repair misfire fault 5. Replace catalytic converter

DTC	P0444	EVAP Canister solenoid valve fault	
Set up emergency control programs.		Light on malfunction indicator light	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	Main relay138	2	12V
Control	E46	1	0-12V square wave
Possible source of trouble		Please refer to troubleshooting solutions	
1. control circuit open 2. Coil open		1.Repair harness and connector 2. Replace the solenoid valve.	

DTC	P0458	The voltage of EVAP Canister solenoid valve is too low	
Set up emergency control programs.		Light on malfunction indicator light	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	Main relay138	2	12V
Control	E46	1	0-12V square wave
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit short to ground		1.Repair harness	

DTC	P0459	The voltage of EVAP Canister solenoid valve is too high	
Set up emergency control programs.		Light on malfunction indicator light	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	Main relay138	2	12V
Control	E46	1	0-12V square wave
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit short to power		1.Repair harness	

DTC	P0506	Idle control speed below target idle speed
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
1.Air intake and Exhaust clogged 2. Engine mechanical failure. 3. Throttle generator power-supply failure 4. Throttle seizure 5. Throttle internal fault 6.ECM failure		1.Troubleshoot 2.Troubleshoot 3. Repair harness fault 4. Replace throttle 5. Replace throttle 6. Replace ECM

DTC	P0507	Idle control speed above target idle speed
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
1. The intake pipe leakage 2. Throttle seizure 3. Throttle internal fault 4.ECM failure		1.Troubleshoot 2. Replace throttle 3. Replace throttle 4. Replace ECM

DTC	P0560	System battery voltage signal improper
	P0562	System battery voltage too low
	P0563	System battery voltage too high
Set up emergency control programs.		Light on malfunction indicator light being prone to pack up
Possible source of trouble		Please refer to troubleshooting solutions
1. The battery is dead or poor connected 2. Excitation circuit open 3. Generator does not generate 4. Alternator regulator failure		1.Troubleshoot 2. Repair circuit failure 3. Replace alternator 4. Replace alternator

DTC	P0602	Electronic Control Unit encoding failure
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
1. ECM data error		1. Replace or refresh ECM

DTC	P0604	Electronic Control Unit RAM failure
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
1. The battery wire not connected 2. Internal control module error		1. Resume power supply 2. Replace ECM

DTC	P0605	Electronic Control Unit ROM failure
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
1. Internal Module error		1. Replace ECM

DTC	P0606	Electronic Throttle security monitoring function failure
Set up emergency control programs.		Light on malfunction indicator light, may be accompanied by throttle pedal and throttle error codes
Possible source of trouble		Please refer to troubleshooting solutions
1. Throttle pedal position sensor fault Electronic throttle position sensor fault 3. ECM internal fault		1. Repair throttle pedal related failure 2. Repair Electronic Throttle related failure 3. Replace ECM

DTC	P0627	Control circuit of fuel pump relay fault	
Set up emergency control programs.		Light on malfunction indicator light, cannot start	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	154	87	12V
Coil Power	153	86	12V
Output	152	30	12V
Control	E69	85	1～8V
Possible source of trouble		Please refer to troubleshooting solutions	
1. control circuit open 2. Coil open		1.Repair harness and connector 2. Replace the relay	

DTC	P0628	The voltage of control circuit of fuel pump relay is too low	
Set up emergency control programs.		Light on malfunction indicator light, cannot start	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	154	87	12V
Coil Power	153	86	12V
Output	152	30	12V
Control	E69	85	1～8V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit short to ground		1.Repair harness and connector	

DTC	P0629	The voltage of control circuit power of fuel pump relay is too high	
Set up emergency control programs.		Light on malfunction indicator light, cannot start	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	154	87	12V
Coil Power	153	86	12V
Output	152	30	12V
Control	E69	85	1～8V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit short to power		1.Repair harness and connector	

DTC	P0650	MIL driving circuit fault	
Set up emergency control programs.		Light on malfunction indicator light	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	140		12V
Control	E31		1～8V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit open/short to ground/power 2.MIL burned out		1.Repair harness 2. Replace malfunction indicator light	

DTC	P1545	Electronic Throttle actual position and target position error exceeds the limit
Set up emergency control programs.		Light on malfunction indicator light,ECM cut throttle actuator current, and the return valve back to 6 degrees of throttle position though spring. And then, according to opening of the accelerator pedal, ECM adjust the engine power output through control of fuel injection (intermittent fuel shut off) and ignition timing, to allow vehicles to continue to maintain a minimum speed.
Possible source of trouble		Please refer to troubleshooting solutions
1. Motor driving circuit failure 2.Throttle position sensor fault 3. Throttle motor failure 4. Throttle seizure		Check whether the actual position is consistent with the theoretical position 1. Replace throttle 2. Repair throttle position sensor circuit fault 3. Replace throttle 4. Replace throttle

DTC	P1558	Too much resistance for opening throttle
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
1. Too much carbon cumulated on throttle 2. Throttle seizure 3. Throttle internal fault		1. Clean Throttle 2. Replace throttle 3. Replace throttle

DTC	P1565	Throttle lower limit position initialization self-learning failure
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
1. Self learning failures 2.ECM failure		1. Self-learning throttle again 2. Replace ECM

DTC	P1568	Too much resistance for pulling back throttle
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
1. Too much carbon cumulated on throttle 2. Throttle seizure 3. Throttle internal fault		1. Clean Throttle 2. Replace throttle 3. Replace throttle

DTC	P1651	SVS light driving circuit fault	
Set up emergency control programs.		Light on malfunction indicator light	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	160		12V
Control	E11		1～8V
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit open/short to ground/power 2.SVS light burned out		1.Repair harness 2. Replace malfunction indicator light	

DTC	P2088	The voltage of VVT Intake Control Valve Circuit is too low	
Set up emergency control programs.		Light on malfunction indicator light, off VVT control	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	143	1	12V
Control	48	2	1-12V square wave
Possible source of trouble		Please refer to troubleshooting solutions	
1. Harness circuit open or short to low-voltage 2. OCV valve coil fault		1.Repair connector and circuit 2. Replace OCV valve	

DTC	P2089	The voltage of VVT Intake Control Valve Circuit is too high	
Set up emergency control programs.		Light on malfunction indicator light, off VVT control	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Power supply	143	1	12V
Control	48	2	1-12V square wave
Possible source of trouble		Please refer to troubleshooting solutions	
1.Control circuit short to power		1.Repair harness	

DTC	P2106	Electronic Throttle drive-level failure
Set up emergency control programs.		Light on malfunction indicator light, torque limits electronic throttle function disabled with the other error codes coming out
Possible source of trouble		Please refer to troubleshooting solutions
1. Electronic throttle harness open or short 2.Electronic throttle motor failure 3.Throttle position sensor fault 4, Intake air pressure sensor failure 5.ECM failure		1. Repair harness 2. Replace throttle 3. Replace throttle 4. Repair oxygen sensor failure 5. Replace ECM

DTC	P2122	The voltage of accelerator pedal position sensor1 signal is too low	
Set up emergency control programs.		Light on malfunction indicator light, applying sensor 2 signal, if both failed, maintain a high idling speed	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor 1 ground	E36	3	0V
Sensor 1 power supplied	E33	2	5V
Sensor 1 signal	E16	4	0.7～-4.55V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Circuit open 2. Signal wire open to ground 3. Sensor internal Open		1. Repair harness 2. Repair harness 3. Replace pedal	

DTC	P2123	The voltage of accelerator pedal position sensor1 signal is too high	
Set up emergency control programs.		Light on malfunction indicator light, applying sensor 2 signal, if both failed, maintain a high idling speed	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor 1 ground	E36	3	0V
Sensor 1 power supplied	E33	2	5V
Sensor 1 signal	E16	4	0.7～-4.55V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Power-supply wire or Signal wire short to power 2. Sensor internal failure		1. Repair harness 2. Replace pedal	

DTC	P2127	The voltage of accelerator pedal position sensor2 signal is too low	
Set up emergency control programs.		Light on malfunction indicator light, applying sensor 1 signal, if both failed, maintain a high idling speed	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor 2 ground	E35	1	0V
Sensor 2 power supplied	E32	5	5V
Sensor 2 signal	E40	6	0.3～-2.3V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Circuit open 2. Signal wire open to ground 3. Sensor internal Open		1. Repair harness 2. Repair harness 3. Replace pedal	

DTC	P2128	The voltage of accelerator pedal position sensor2 signal is too high	
Set up emergency control programs.		Light on malfunction indicator light, applying sensor 1 signal, if both failed, maintain a high idling speed	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Sensor 2 ground	E35	1	0V
Sensor 2 power supplied	E32	5	5V
Sensor 2 signal	E40	6	0.3～2.3V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Power-supply wire or Signal wire short to power 2. Sensor internal failure		1. Repair harness 2. Replace pedal	

DTC	P2138	Accelerator pedal position sensor signal improper
Set up emergency control programs.		Light on malfunction indicator light,maintain a high idling speed
Possible source of trouble		Please refer to troubleshooting solutions
1. Sensor 1 and 2 circuit couple 2. Accelerator pedal fault		1.Repair harness 2.Replace accelerator pedal

DTC	P2177	Air-fuel ratio closed loop control self-learning value above upper limit (medium load zone)
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
Fuel dilute continuously, long-term fuel correction + 20 % 1.Fuel and gas mixture too dilute. 2. Upstream oxygen sensor failure		1. Repair the air intake and exhaust, fuel systems failure 2. Repair upstream oxygen sensor signal error fault

DTC	P2178	Air-fuel ratio closed loop control self-learning value above lower limit (medium load zone)
Set up emergency control programs.		Light on malfunction indicator light
Possible source of trouble		Please refer to troubleshooting solutions
Fuel dilute continuously, long-term fuel correction + -20% 1.Fuel and gas mixture too thick. 2. Upstream oxygen sensor failure		1. Repair the air intake and exhaust, fuel systems failure 2. Repair upstream oxygen sensor signal error fault

DTC	P2195	Upstream oxygen sensor aging (too dilute)	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears System stops controlling the oxygen signal closed-loop	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	3	/
Signal positive	E18	4	0～-1V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Fuel and Gas mixture long-term dilute. 2. Oxygen sensor aging, oxygen signal long-term dilute.		1. Repair the air intake and exhaust, fuel systems failure 2, Replace Oxygen sensor.	

DTC	P2196	Upstream oxygen sensor aging (too thick)	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears System stops controlling the oxygen signal closed-loop	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	E36	3	/
Signal positive	E18	4	0～-1V
Possible source of trouble		Please refer to troubleshooting solutions	
1. Fuel and Gas mixture long-term thick. 2. Oxygen sensor aging, oxygen signal long-term thick.		1. Repair the air intake and exhaust, fuel systems failure 2, Replace Oxygen sensor.	

DTC	P2270	Downstream oxygen sensor aging (too dilute)	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	130	1	12V
Signal positive	E28	2	Low-voltage
Possible source of trouble		Please refer to troubleshooting solutions	
2. Fuel and Gas mixture long-term dilute. 2. Oxygen sensor aging, oxygen signal long-term dilute.		1. Repair the air intake and exhaust, fuel systems failure 2,Replace Oxygen sensor.	

DTC	P2271	Downstream oxygen sensor aging (too thick)	
Set up emergency control programs.		Light on malfunction indicator light till the fault disappears	
Terminals:	ME7	Pins of Sensor	Normal Measurement signal
Signal negative	130	1	12V
Signal positive	E28	2	Low-voltage
Possible source of trouble		Please refer to troubleshooting solutions	
2. Fuel and Gas mixture long-term thick. 2. Oxygen sensor aging, oxygen signal long-term thick.		1. Repair the air intake and exhaust, fuel systems failure 2, Replace Oxygen sensor.	

Engine anti-theft system

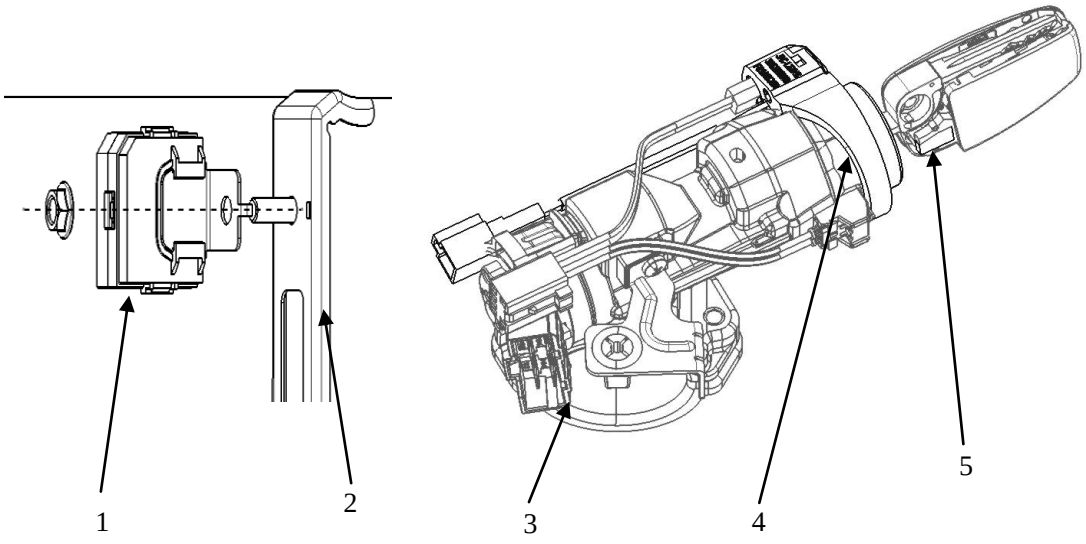
System overview

Engine anti-theft system achieves security feature through two electronic encryption: Transponder and IMMO, IMMO and ECM, after going though Transponder's wireless identification, IMMO will go under EC0M's wired identification, if identified, ECM will ignite and inject fuel normally, and if it is not identified, the motor will not start, and thus to achieve encryption anti-theft and make the vehicle more reliable and secure.

Anti-theft system consists of 4 components: Intrusion Indicator light (integrated on the dashboard) and anti-theft controller, transponders, Anti-Theft coil; details are as follows:

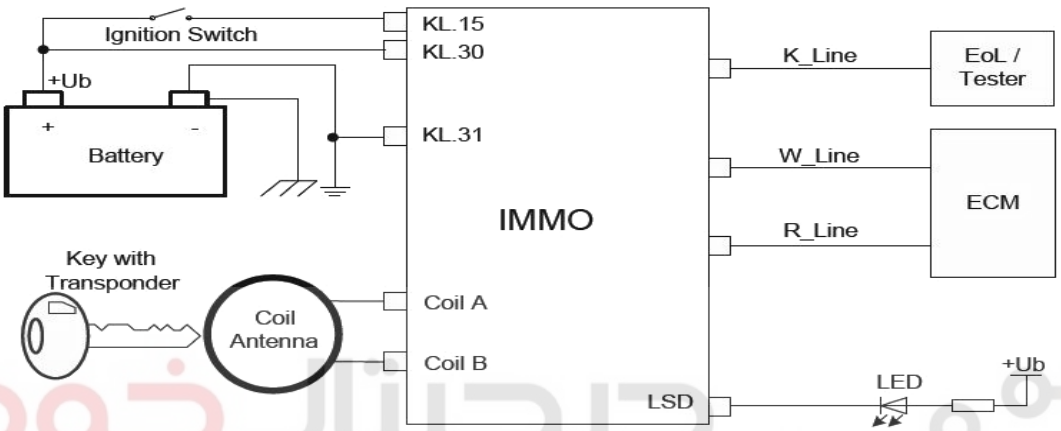
Part name	Quantity	Remarks
Anti-theft controller.	1	The controller is installed under the frame support
Transponders.	2	The transponders are installed within the two keys
Anti-Theft coil	1	The coil is installed on the ignition lock
Alarm indicator light	1	the intrusion indicator symbol integrated in the instrument cluster: .

Components and their location map



1 - Anti-theft controller 2-Beam support 3 - Ignition lock 4 -Anti-Theft sensor coil 5 - Transponders.

Illustrative diagram



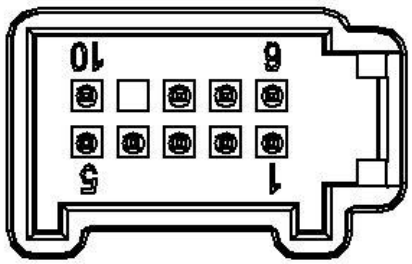
Anti-theft System Illustrative Diagram

Components inspection

1. Check whether the power supply of Anti-theft system controller works (9 V - 16 V).

2. The terminal definitions of Anti-theft system control model are as follows:

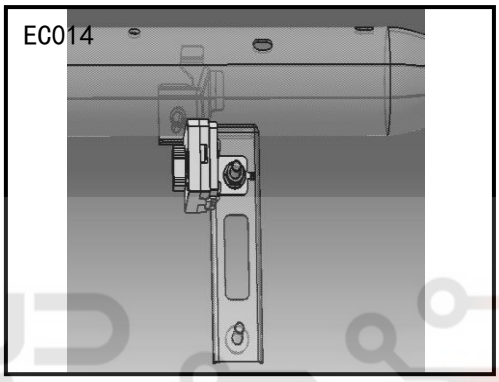
Controller Terminal Definition Table

Anti-theft controller connectors	Pin definition		Remarks
	1	Antenna 1	
	2	B+	
	3	IG1	
	4	W-wire	
	5	R-wire	
	6	Antenna 2	
	7	GND	
	8	LED	

	9	NC	
	10	K-wire(Diagnostic Interface)	

The installation and removal of components

The installation and removal of Anti-theft controller

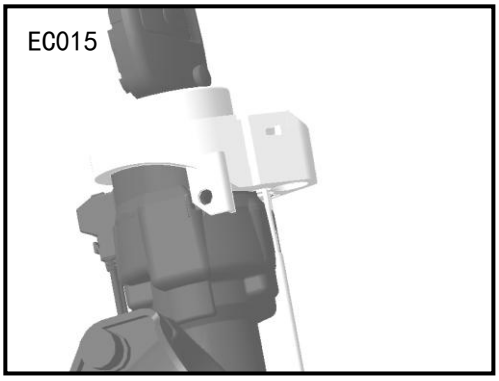


1) Removal procedures

- Disconnect negative battery terminal.
- Remove mounting bolts of controller on the beam support under instrument desk .
- Disconnect the controller port and wire port connector.

2) Install according to the reverse steps of removal.

The removal and installation of Anti-theft sensing coil.



1) The removal and installation of Anti-theft sensing coil.

- Disconnect negative battery terminal.
- Remove the ignition lock.
- Remove the screw of Anti-theft coil and ignition lock.
- Disconnect the Anti-theft port connector;

2) Install according to the reverse steps of removal.

The transponders are installed in the keys and are supplied together with key

assembly.

Diagnose and Match

1) Trouble Diagnosis

When a vehicle fails, the service technician can use diagnostic instruments to get the digital code which represents failure information from the memory of Anti-theft controller. Based on the code that corresponds to the specified error message, the service technicians are able to quickly locate the point of failure, and to troubleshoot and repair; common types of failures are as follows:

NO	Meaning
1	Anti-theft coil short to ground
2	Anti-theft coil open to power source
3	Anti-theft coil short to power source
4	Anti-theft controller does not store any key information
5	PIN code isn't put into Anti-theft controller.
6	Anti-theft controller does produce SK.
7	Anti-theft controller failed the ECM identification.
8	Key Identification failed
9	Base station cannot communicate

2) Off line/After-sales Match Functions

The diagnostic function of Anti-theft controller can be used for the match of the whole engine anti-theft system (including keys, Anti-theft controller, and engine control module) when engines are off line from the plant.

The function also supports to replace the keys, Anti-theft controller, and engine control module within the whole engine anti-theft system.

Any of the devices needs to be re-matched, if you need to replace any one of keys, anti-theft controller and engine control module. As to the matching process, please reference to operating manual of the diagnostic scanner.

Note: There are 3 flashing mode in IMMO indicator light: When the whole vehicle battery is powered on and key is in the ignition switch OFF position, the indicator light's flash cycle is 5 seconds, each cycle indicator lights for 250 MS; When key is switched onto the ignition switch ON position, if anti-theft system identification succeeds, the indicator light is off and remains at dim status; if authentication fails, the LED flashes 0.5 seconds to cycle, each cycle indicator lights for 250 MS, the vehicle will not start. If identification fails and cannot start, please contact your service technician to diagnosis the system.