

Model GW491QE petrol engine

Service Manual

Engine service & maintenance data.....	G1
United Electronic engine management system.....	EF.1
Delphi engine management system.....	EF.2
Engine body.....	EM.1
Cylinder head.....	EM.2
Valve mechanism.....	EM.3
Cooling system.....	CO
Lubrication system.....	LU
Ignition system.....	IG
Starting system.....	ST
Charge device.....	CH
Clutch.....	CL

S.N	Operation steps	Check result	Follow-up steps
14	Pull out the plug of idle-speed actuator from wiring harness before the engine cooling temperature reaches 35 °C , then observe whether the engine rotating-speed has been decreased.	Yes	Next step.
		No	Repair or change the idle-speed adjustor
15	Place ignition switch on the “ON” position, and check whether respective voltage on following pins of ECU is normal: Whether the accumulator voltage on Pin 27 is at about 12V, and whether respective voltage on Pin 14 &19 is 0.	Yes	Next step.
		No	Check the wiring harness, and socket connector.
16	Check whether the compressive pressure inside engine cylinder is normal.	Yes	Next step.
		No	Clear the failure away.
17	Check whether the absolute pressure /temperature sensor of inlet manifold has been blocked.	Yes	Repair or change it.
		No	Next step.
18	Check whether the cooling-fluid temperature sensor is normal.	Yes	Change ECU
		No	Repair or change it

4.The cold vehicle is starting with difficulty.

S.N.	Operation steps	Check result	Follow-up steps
1	Place ignition switch to the“ON”position. A fault diagnosis instrument may be used to check whether there’s any record of failure information.	Yes	Clear the displayed failure away.
		No	Next step.
2	A multimeter may be used to check whether the cooling-fluid temperature sensor is normal. (Or a 1.5K Ω resistor may be serially connected between Pin 45 and Pin 30 of ECU to take the place of cooling-fluid temperature sensor to start the engine; That it’s able to be started indicates an abnormality of cooling-fluid temperature sensor).	Yes	Next step.
		No	Change the sensor
3	After the connection of ignition switch, connect a commutator between ECU and wiring harness, and check whether respective voltage on following pins of ECU is normal: Whether the accumulator voltage on Pin 27 is at about 12V, and whether respective voltage on Pin 14 &19 is 0V.	Yes	Next step.
		No	Check the wiring harness, and socket connector.
4	Check whether the passage of air filter is free.	Yes	Next step.
		No	Change it.
5	Following a successful starting process, check whether the pressure of inlet manifold when at idle-speed is within 35kpa and 65kpa.	Yes	Next step.
		No	Settle the air leakage within air inlet system.
6	Observe whether it’s easy to start by gently stepping on the throttle valve.	Yes	Check the throttle valve and idle-speed actuator.
		No	Next step.
7	Pull out the plug of idle-speed actuator from wiring harness before the engine cooling-fluid temperature reaches 35 °C , then observe whether the engine rotating-speed has been decreased.	Yes	Next step.
		No	Repair and change the idle-speed actuator.
8	Following the connection of fuel manometer valve, have the Pin 86 of fuel pump relay directly connected to ground, and connect the ignition switch; Check whether the fuel pressure is within (250~300) kpa while the fuel pump and its relay are working.	Yes	Next step.
		No	12
9	Check whether the oil injector is able to work in a normal way after it has been provided with a 12V voltage by accumulator via special connector.	Yes	11
		No	Next step.
10	Re-check whether the oil injector is working after it has been washed.	Yes	Next step.
		No	Change the oil injector.
11	Check whether fuel contains water or has deteriorated.	Yes	Change the fuel
		No	Next step.

2.M7.9.7 system service & diagnosis flow process based on fault code

Fault code: P0107 “the signal voltage in the loop of inlet-air pressure sensor is too low”

S.N.	Operation steps	Check result	Follow-up steps
1	Connect with the diagnosis instrument, and place the ignition switch to the “ON” position.		Next step.
2	Observe whether the item “inlet air pressure” in data stream is about 101kpa (specific data depends on the existing pressure).	Yes	Continue to proceed until step 5.
		No	Next step.
3	Pull out the plug of inlet-air pressure sensor from wiring harness, and a multimeter may be used to check whether the voltage between Pin 3 and Pin 1 of plug is about 5V.	Yes	Continue to proceed until step 5.
		No	Next step.
4	Check whether respective loops between Pin 17/33/37 of ECU and the connection Pin 1/3/4 of sensor are short circuit to ground.	Yes	Repair or change the wiring harness.
		No	Next step.
5	Start the engine and have it running at idle-speed; Step on the gas slowly until it's full opened and observe the change of value at item “inlet-air pressure” on diagnosis instrument, the displayed value shall be with slight changes; Step on the gas quickly until it's close to a full open degree, the displayed value shall reach a value greater than 90kpa instantaneously.	Yes	Diagnosis help.
		No	Change the sensor.

Fault code: P0108 “the signal voltage in the loop of inlet-air pressure sensor is too high”

S.N.	Operation steps	Check result	Follow-up steps
1	Connect with the diagnosis instrument, and place the ignition switch to the “ON” position.		Next step.
2	Observe whether the item “inlet-air pressure” within data stream is about 101kpa (exact data is subject to the existing pressure).	Yes	Continue to proceed until step 5.
		No	Next step.
3	Pull out the plug of inlet-air pressure sensor from wiring harness, and a multimeter may be used to check whether the voltage between Pin 3 and Pin 1 of plug is about 5V.	Yes	Continue to proceed until step 5.
		No	Next step.
4	Check whether respective loops between Pin 17/33/37 of ECU and the connection Pin 1/3/4 of sensor are short circuit to power supply.	Yes	Repair or change the wiring harness.
		No	Next step.
5	Start the engine and have it running at idle-speed; Step on the gas slowly until it's full opened and observe the change of value at item “inlet-air pressure” on diagnosis instrument, the displayed value shall be with slight changes; Step on the gas quickly until it's close to a full open degree, the displayed value shall reach a value greater than 90kpa instantaneously.	Yes	Diagnosis help.
		No	Change the sensor.

Fault code: P0112 “The temperature indicated by the inlet-air temperature sensor is too low”

S.N.	Operation steps	Check result	Follow-up steps
1	Connect with the diagnosis instrument, and place the ignition switch to the “ON” position.		Next step.
2	Observe whether the value of item “inlet-air temperature” in data stream is fit for the temperature inside the air-inlet pipe (specific value depends on the existing pressure). Note: If the displayed value is always -40℃, it indicates a possible failure caused by a broken loop.	Yes	Continue to proceed until step 5.
		No	Next step.
3	Pull out the plug of inlet-air temperature sensor from wiring harness, and a multimeter may be used to check whether the resistance between Pin 1 and Pin 2 of sensor is fit for the temperature.	Yes	Next step.
		No	Change the sensor.
4	Pull out the plug of inlet-air temperature sensor from wiring harness, and a multimeter may be used to check whether the voltage between Pin 1 and Pin 2 of sensor is about 5V.	Yes	Continue to proceed until step 5.
		No	Next step.
5	Check whether respective loops between Pin 17 & 40 of ECU and the connection Pin 1 & 2 of sensor are broken loops, or short circuit to power supply.	Yes	Repair or change the wiring harness.
		No	Next step.
6	Start the engine and have it running at idle-speed. Observe the change of value at item “inlet-air temperature” displayed on diagnosis instrument, and whether the value is increased accordingly when the engine inlet-air temperature is being increased.	Yes	Diagnosis help.
		No	Change the sensor.

9. Key points to failure elimination when fault indicator light is lighting

- (a) A Fault Diagnosis Instrument may be used to read out fault code and to find out its appropriate content ;
- (b) Most failures displayed and indicated by fault code are caused by loop failure or bad connection of plug connectors;
- (c) Check at top priority the sensor or actuator or its relevant loops as indicated by fault code;
- (d) Relevant loops may be checked by measuring the resistance or voltage;
- (e) Results of failure elimination may be determined using a Fault Diagnosis Instrument to observe whether the read value of sensor satisfies requirements;
- (f) Results of failure elimination may also be determined using a Fault Diagnosis Instrument to operate and control the action of actuator;
- (g) Drive vehicle once for verification on failure elimination.

Precautions to the use /service /troubleshooting of electrical injection system

1. Routine use and service

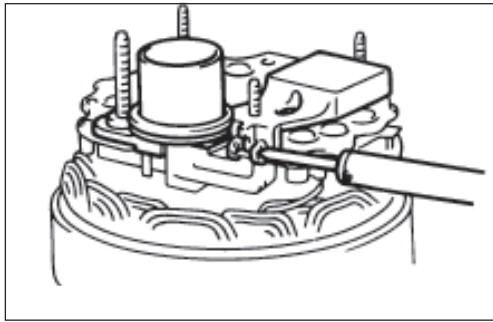
- (a) The petrol to be used shall be quality lead-free vehicle petrol which is $\geq 93\#$ (GB17930-1999). It's specially noted here that filling oil tank with petrol containing lead for one time will make three-way catalytic converter lose its function completely;
- (b) Any abnormal oil consumption shall be settled timely, as phosphorus content in machine-oil will make the oxygen sensor and three-way catalytic converter lose their function;
- (c) An immediate troubleshooting shall be performed if the fault indicator light is lighting while engine is running;
- (d) Do not operate any mechanism on engine (including gas pedal) when starting engine; and the clutch shall be disconnected when it's cold;
- (e) Vehicle shall be running at high speed from time to time to clear away any possible carbon deposit remained in engine and air exhaust system, and to prevent three-way catalytic converter from damage due to temporary poison;
- (f) If fire occurs on some cylinder, stop the vehicle immediately to check and settle it, as gas mixture without sufficient combustion will continue to re-combust inside exhaust manifold, which results in a fast damage on oxygen sensor and three-way catalytic converter; If ignition failure can not be eliminated at one time, It's required to remove the plug to fuel supply injection nozzle on the cylinder having a fire on a temporary basis, and to drive the vehicle at low or medium speed to service station for repair.
- (g) During a long-term storage period, the vehicle or engine needs a running once every one month to prevent glue film from forming on injection nozzle or fuel pump.
- (h) Petrol filter shall be changed once every (7,000 ~ 10,000) km; When under a normal use condition, throttle valve and injection nozzle shall be washed annually or every 20,000 kilometers; When a dismantle-free method is applied to wash injector, ensure that additive to be used contains no materials harmful to oxygen sensor and three-way catalytic converter;
- (i) When performing an inspection on dual idle-speed exhaust, remember to sufficiently preheat the engine and three-way catalytic converter, and to measure the high idle-speed first before the low idle-speed;

2. Precautions during installation of accessories for electrical-injection system

- (a) When air conditioner is installed on vehicle not having been equipped with air conditioner in the plant, (The interface for air conditioner signal control has already been provided for system wire-harness in most cases), be familiar with the working principal of loops, and do not have the installed air conditioner out of control by computer, otherwise, auxiliary functions under the control of system air conditioner may not be effected, which will influence the normal working of engine;
- (b) In cold areas, increase or enlarge auxiliary water tank (s) for warming purpose; Excessive use of engine for warming purpose might lead to a much lower coolant temperature, thus, it will worsen the engine abrasion, increase fuel consumption, and produce carbon deposits inside the engine and air exhaust system;
- (c) When theft detector out of control by computer is increased to original device, do not cut off ECU permanent power supply, or the normal working of electrical-injection system will be influenced; The increment of ECU theft detector to original device shall be subject to an approval by Delphi company.
- (d) The carbon-canister solenoid valve is subject to ECU control and adjustment; The function of fuel evaporation from carbon-canister into engine is to ensure the normal working of engine when carbon-canister is with desorption. The evaporation/exhaust control effect of fuel tank will be directly affected by the size of capacity for activated carbon canister: if the capacity is too small, fuel evaporated gas might get out of the canister when at high temperature or at idle speed for long time. If there's any smell like fuel evaporated gas nearby the carbon-canister, replace with a carbon-canister having a large capacity to settle it.

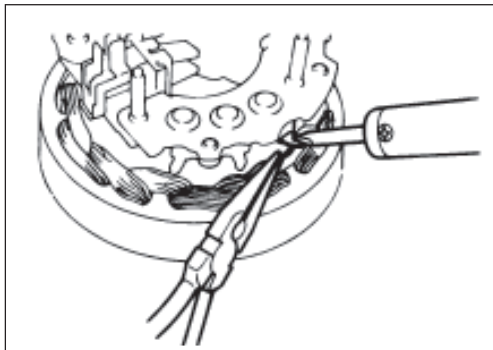
3. Precautions when clearing failure

- (a) As parts & components within the electrical-injection system are with high reliability, relevant mechanical parts & components, system plug connectors, and wire-harness shall be checked at top priority whereby any abnormality is found on vehicle or engine; Prior to a determination on the damage of some part & component, an alternative test must be made repeatedly for inspection purpose;
- (b) When fuel system parts & components are dismantled (eg. change of filter, dismantle of fuel pump, dismantle of oil inlet /return pipeline on fuel-rail), duster cloth may be used to cover the connection point on oil pipe before connector is loosened to relieve oil pressure in pipeline. During operation, always prevent fuel from splashing onto engine or its high-temperature exhaust pipeline;



5. Removal of IC adjustor

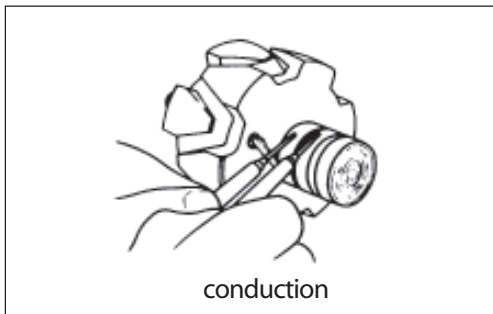
When the terminal of IC adjustor is gripped using nipper pliers, remove it by welding.



6. Removal of rectifier support

When the terminal of IC adjustor is gripped using nipper pliers remove the lead wire by welding.

Note : Measures shall be taken to prevent the rectifier from damage resulting from burning.



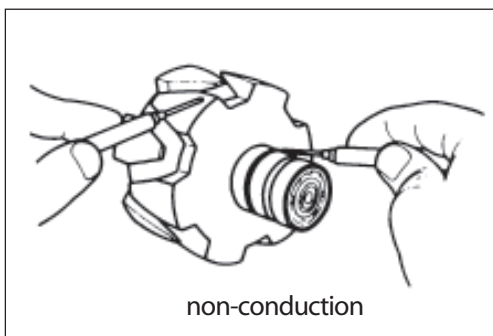
Inspection on AC generator Rotor

1. Check whether the rotor is in an open circuit.

Use an ohmmeter to check the conduction between slip rings.

Standard resistance: 4Ω

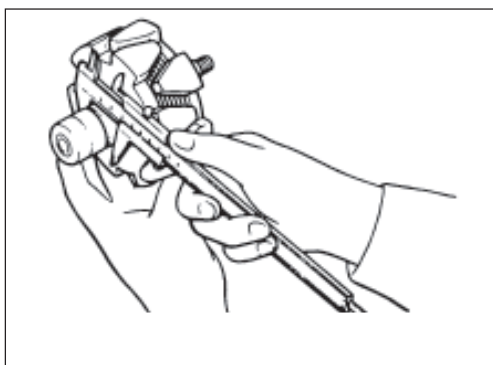
The rotor needs to be changed if non-conduction exists.



2. Check whether the rotor has been grounded.

Use an ohmmeter to check the non-conduction between slip ring and the rotor.

The rotor needs to be changed if conduction exists.



3. Check the slip ring

(a) Check whether the surface of slip ring is rough, or has been scratched or damaged.

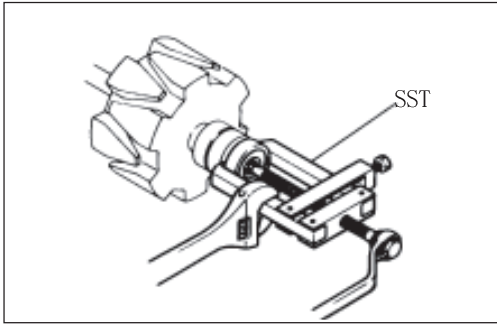
If it does occur, the rotor needs to be changed.

(b) The diameter of slip ring shall be measured using calipers.

Standard diameter: (32.3~32.5)mm

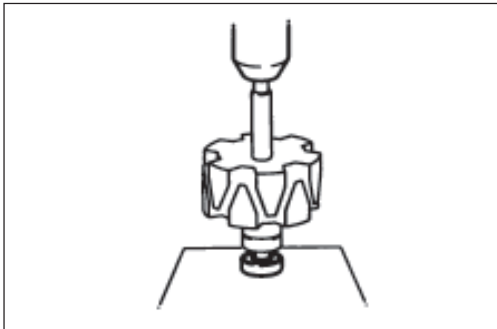
Min. diameter: 32.1 mm

If the diameter is less than Min. value, the rotor needs to be changed.

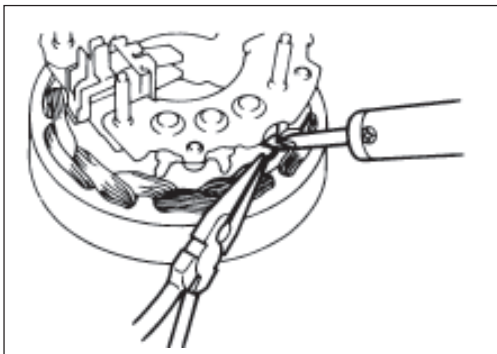


4. Change the bearing when necessary.

- (a) Remove the bearing using SST.
- SST 09286-46011



- (b) Use a press tool to press the new bearing.

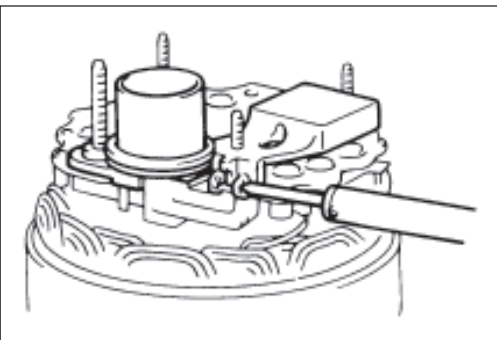


Assembly of AC generator

1. Install the rectifier support onto the stator.

Clamp the rectifier terminal using nipper pliers, and weld the wiring terminal.

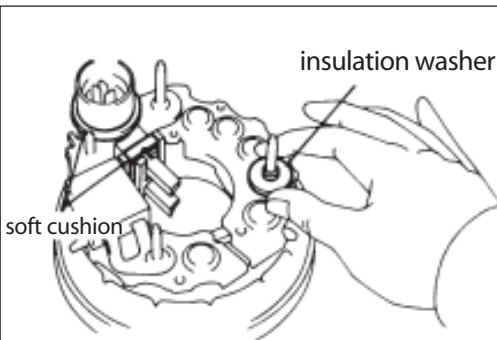
Note: the heat shall be prevented from transmission to rectifier.



2. Installation of IC adjuster

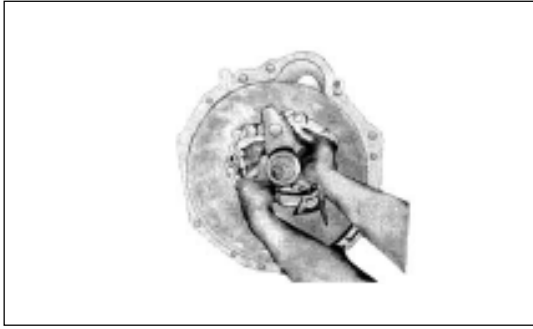
Clamp the rectifier terminal using nipper pliers, and weld the wiring terminal.

Note: the heat shall be prevented from transmission to rectifier.



3. Installation of the rectifier end shell onto rectifier support

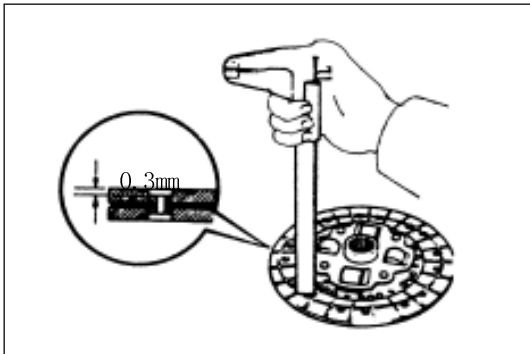
- (a) Put the insulation washer on the positive stud bolt of the rectifier frames
- (b) Put two soft cushions on the electrical-brush frame and AC generator terminal respectively.
- (c) Put the rectifier shell onto the rectifier frame.



Dismantle of clutch components

Dismantle of clutch cover

- (a) Remove bearing, bearing sleeve, and release shifting fork from the transmission.
- (b) Bearing and bearing sleeve, will be pulled out at the same time after removing the stop clamp.
- (c) Remove the release shifting fork, and the protective cover.
- (d) Remove the clutch pressure plate and the clutch friction disk.



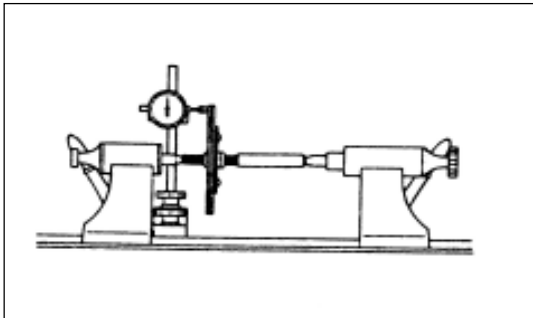
Inspection on clutch components

1. Check whether the clutch friction disk has been abraded or damaged.

Measure the depth of rivet head using a vernier caliper.

Min. depth of rivet head: 0.3 mm

The clutch friction disk needs to be changed if any failure occurs.

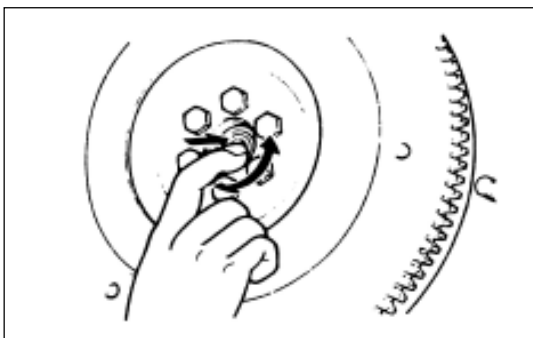


2. Check the radial run-out tolerance on end surface of the clutch driven disk.

Check the radial run-out tolerance on end surface of the clutch driven disk using an amesdial.

Max. radial run-out tolerance : 0.8 mm

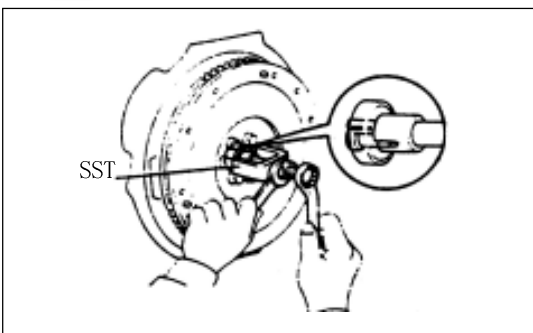
The clutch driven disk needs to be changed whereby the radial run-out tolerance exceeds Max. value.



3. Check the guide bearing

Manually rotate the bearing, and an action force may be applied along the direction of axis line.

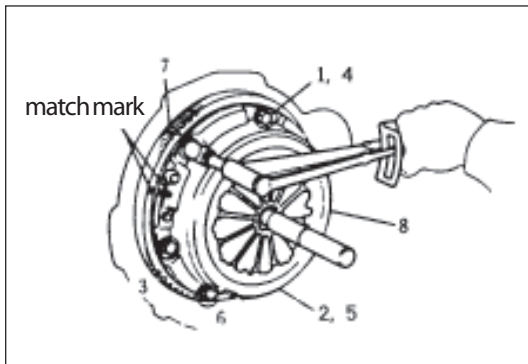
The guide bearing needs to be changed if it can't be rotated, or is rotating with great resistance.



4. Change of guide bearing

(a) Use SST to remove the guide bearing.

SST 09303-35011

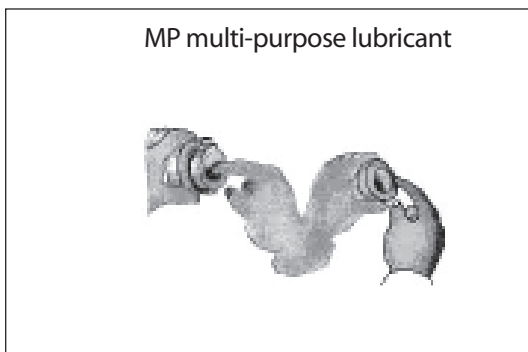


3. Check the alignment on the top of diaphragm spring.

The alignment on the top of diaphragm spring may be measured using an amesdial containing ball bearing. The alignment on the top of diaphragm spring may be adjusted using SST if the deviation is greater than the specified value.

SST 09333-00013

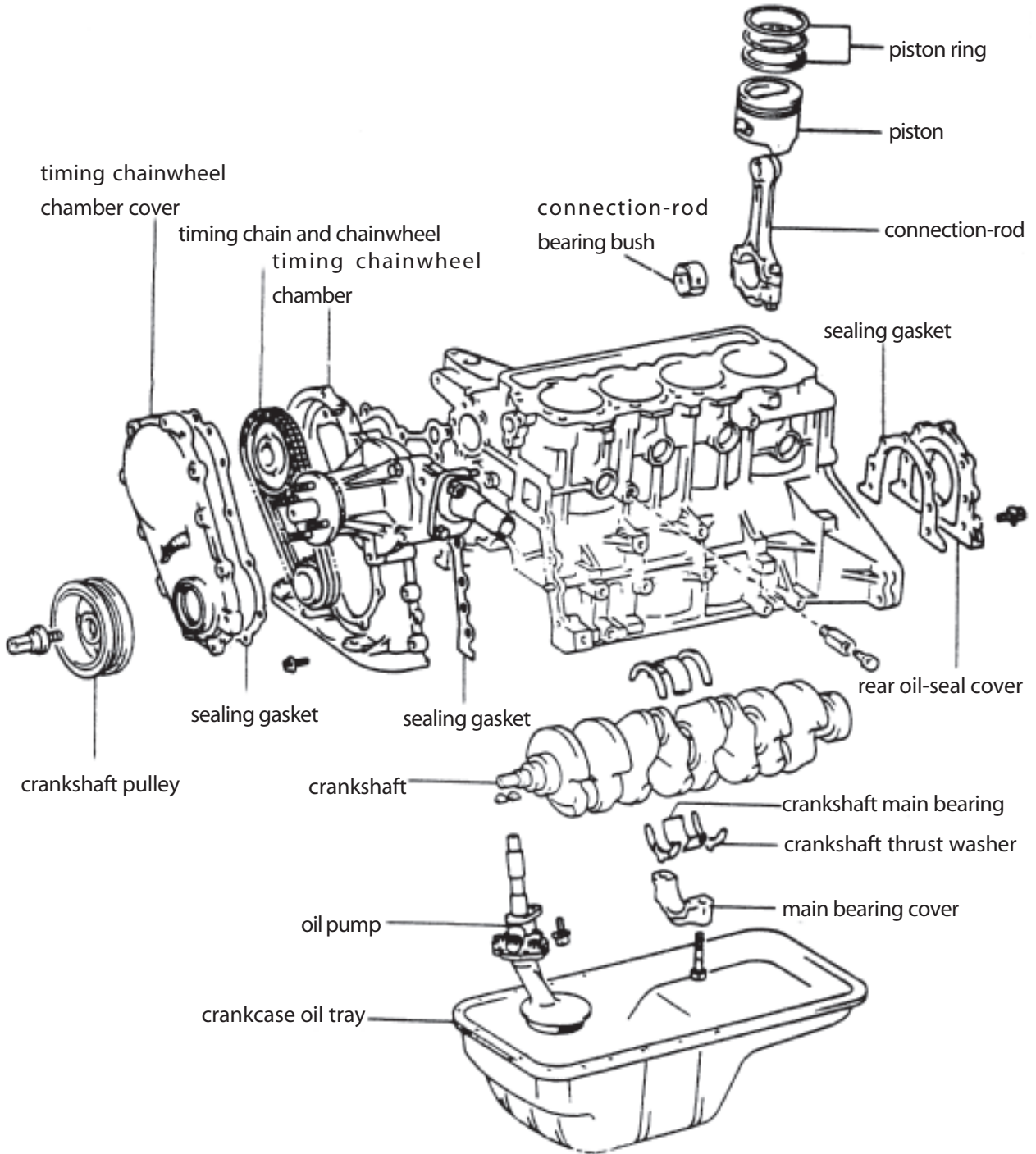
MAX planteress tourance 0.5mm

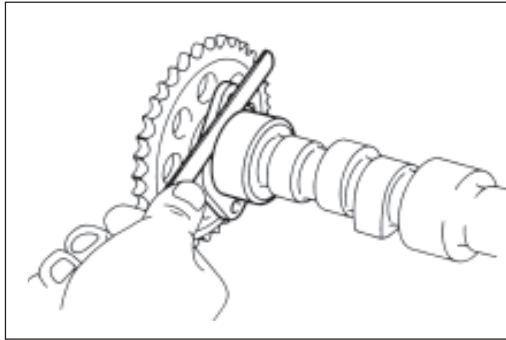


4. Supramoly lithium base grease shall be applied to following parts:

- (a) Contact point between the release shifting fork and the bearing bush;
- (b) Contact point between the release shifting fork and the pushrod;
- (c) Supporting point of the release shifting fork;
- (d) Spline of clutch disk;
- (e) Internal groove of the release bearing shell;
- (f) MP multi-purpose lubricant shall be applied to the front part of the release bearing.

Disassembly figure of engine body





6. Check the axial clearance of camshaft

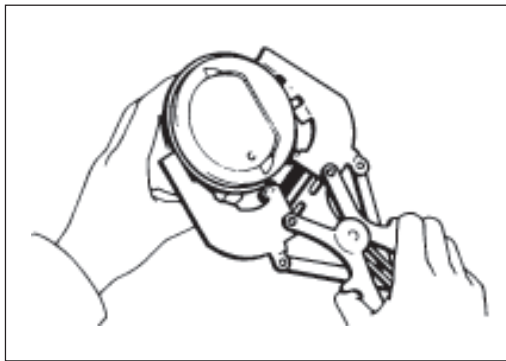
The thrust collar, and the timing chainwheel shall be installed onto the camshaft; and fixing bolts shall be tightened to the specified tightening moment. And a thickness gauge may be used to measure the axial clearan (as shown in figure) on thrust surface between the thrust collar and the front neck-journal of camshaft; The standard value shall be (0.07~0.22) mm, and the limit value shall be 0.3mm. If the actual clearance exceeds the limit value, the thrust collar or camshaft shall be changed.



Disassembly of piston and connection-rod components

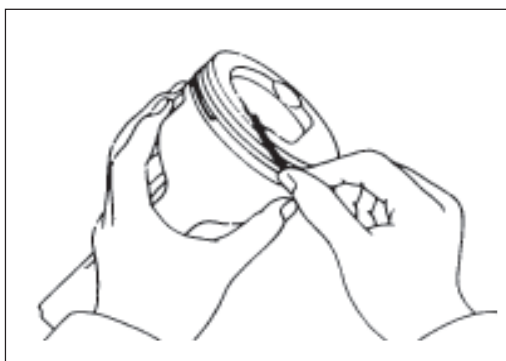
1. Check the mating situation between the piston and the piston pin

Pull the piston installed on piston pin back and forth; If it feels loose, the piston and the piston pin shall be changed.



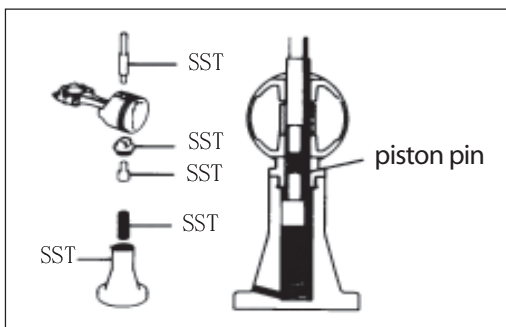
2. Removal of piston ring

(a) The first and second piston ring may be removed using a expander.



(b) Manually remove the retaining ring and the oil piston ring on two sides of oil ring.

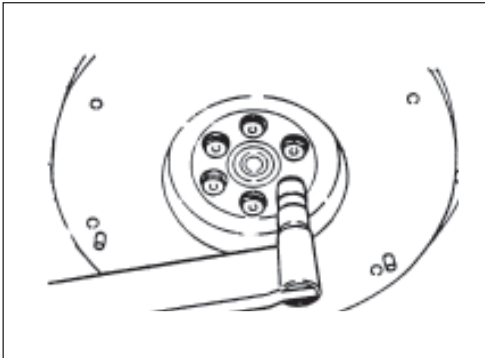
Remark: The piston ring shall be placed in order as per a correct sequence.



3. Remove the connection-rod from the piston

A special tool SST may be used to take out the piston pin.

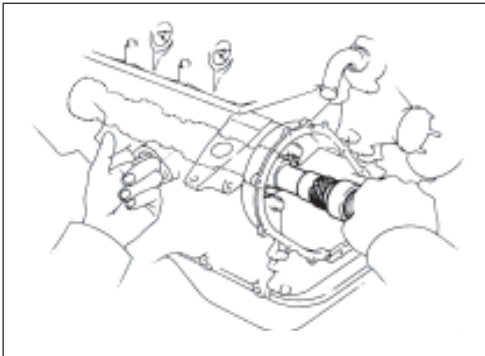
SST 09221-00020 09221-00030 09221-00040
09221-00071 09221-00081



5. Installation of flywheel

When flywheel has been installed to a place behind the crankshaft, manually rotate the flywheel to make it facing exactly the assembly mark made on the rear end surface of crankshaft, then six flywheel bolts will be used to fix the flywheel onto the rear end of crankshaft: the bolts shall be subject to a pre-tightening made by a pneumatic wrench, and a re-tightening diagonally to the specified moment made by a stud bolt tightener.

Tightening moment: $(85 \pm 3) \text{N} \cdot \text{m}$

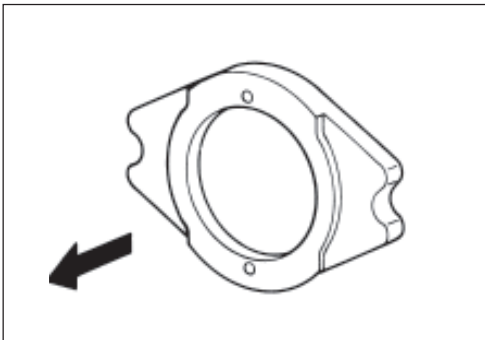


6. Installation of camshaft component

(a) Installation of camshaft:

-Appropriate amount of clean oil shall be applied to five main neck-journal on camshaft, and to gears which connects with the transmission shaft of oil pump.

-Hold the front side of camshaft by right hand, and hold the middle position of camshaft by left hand, and slowly install camshaft into its installation hole. During installation, the camshaft may be drawn manually via original installation hole for petrol pump on the engine body, and will be pushed to the end after each neck-journal is installed onto respective camshaft lining.

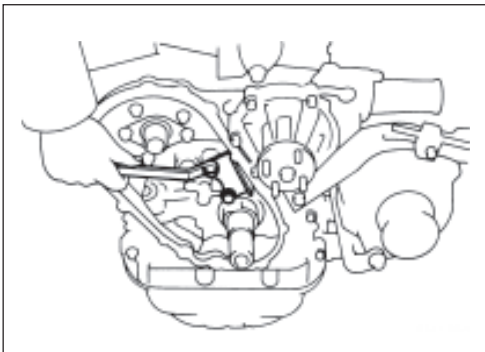


-The thrust collar of camshaft shall be fixed onto engine body at the camshaft hole using two $\text{M8} \times 16$ bolts (with flat washer and standard spring washer).

Tightening moment: $(18 \pm 3) \text{N} \cdot \text{m}$

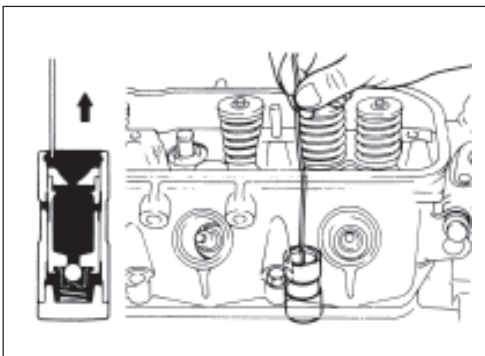
Remark: The thrust collar of camshaft shall make the side having 'pit' mark face outward.

(b) Manually rotate the camshaft, and its rotation shall be flexible. Then the woodruff key of camshaft must be turned to an upward position.



(c) Assembly of chain shock-absorber: Using brush, a layer of clean oil may be applied to the rubber surface of chain shock-absorber, which will be fixed to an appropriate position inside chainwheel chamber using two $\text{M8} \times 16$ bolt (with standard spring washer), and be tightened to the specified moment using a fixed-torque wrench.

Tightening moment: $(18 \pm 3) \text{N} \cdot \text{m}$



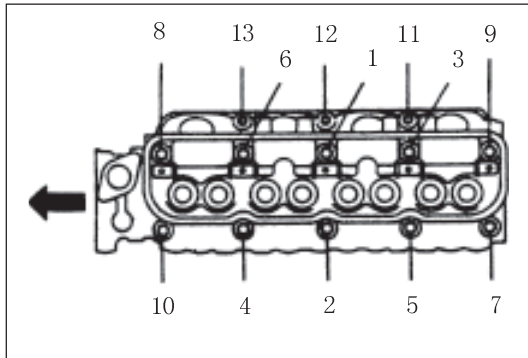
(d) Installation of tappet component: Prior to the assembly, tappet component shall be soaked in clean oil to provide a preliminary lubrication between tappet and tappet hole or between tappet and the cam of camshaft, followed by an manual installation of eight hydraulic tappets successively into tappet holes.

Precautions:

-Always keep it clean and avoid pollution during the whole course of assembly.

-Prevent camshaft from touching or striking its lining during the installation.

-Woodruff key shall be installed to place to have its upper plane parallel to the neck-journal of camshaft.



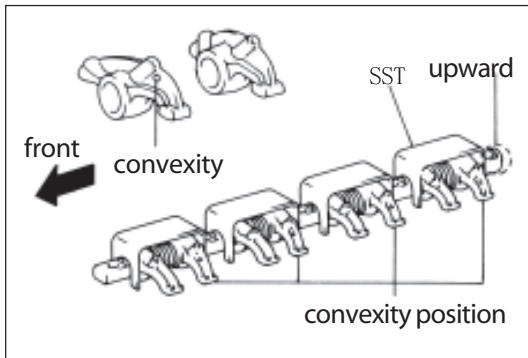
Reinstallation /restoration of cylinder head

1. Installation of cylinder gasket

Cylinder gasket will be installed onto the device plane, and be fixed using positioning pin.

2. Installation of cylinder head

The cylinder head component may be installed onto the cylinder gasket on device unit, be positioned by two positioning pin sleeves, and be fixed using ten M12 cylinder-cover bolts plus three M8 cylinder-cover bolt (with cylinder-cover bolts & washers). Based on the sequence indicated in the figure, a wrench will be used to screw ten M12 bolts to an extent as $90\text{N} \cdot \text{m}$, followed by a complete unscrewing, then a re-screwing to $90\text{N} \cdot \text{m}$; The tightening torque for three M8 bolts shall be $20\text{N} \cdot \text{m}$. Finally, an 100% verification needs to be performed using a fixed torque wrench.



3. Rocker-shaft assembly

(a) Two rocker-shafts inside each cylinder may be fixed together via one special clamping plate.

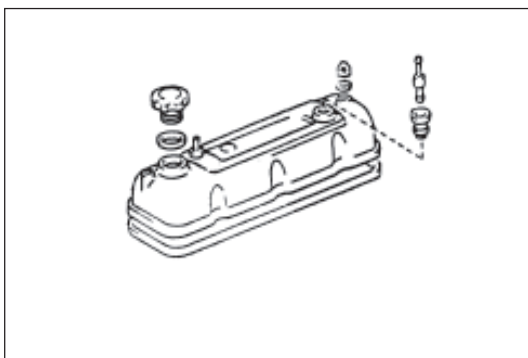
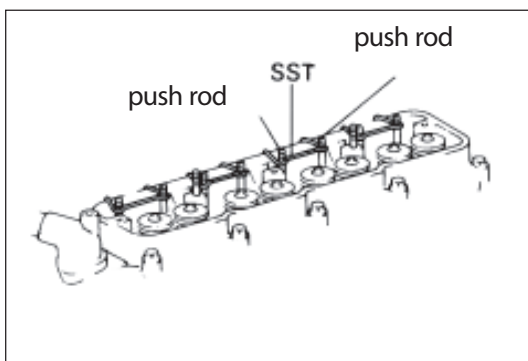
(b) The rocker-shaft assembly shall be installed onto two studbolts on the cylinder head in such a way that one end of rocker-shaft having dummy club (its surface facing upward) will be backward.

SST 09207-71010

(c) Two M8 nut (with flat washer) may be manually screwed onto stud bolt; Screw the short threaded end of three bolts (fixing the rocker-shaft) into the fixed seat for rocker-shaft, followed by a tightening made progressively in two steps as from the middle to two sides (as shown in the figure).

Tightening torque: $(18 \pm 3)\text{N} \cdot \text{m}$

(d) After a layer of clean machine oil has been applied to the ball surface on two ends of the push rod, the lower end will be installed into a ball socket on the tappet cap, while the upper end will be pressed by a special press rod into the ball socket of rocker-shaft while the crankshaft is rotating.



4. Installation of valve chamber cover

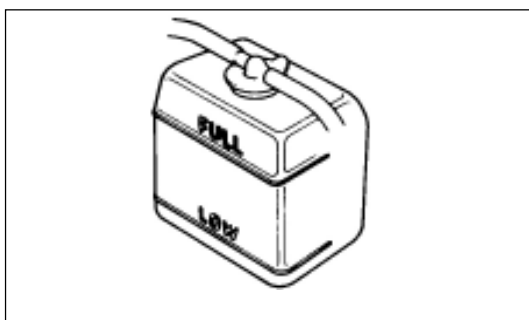
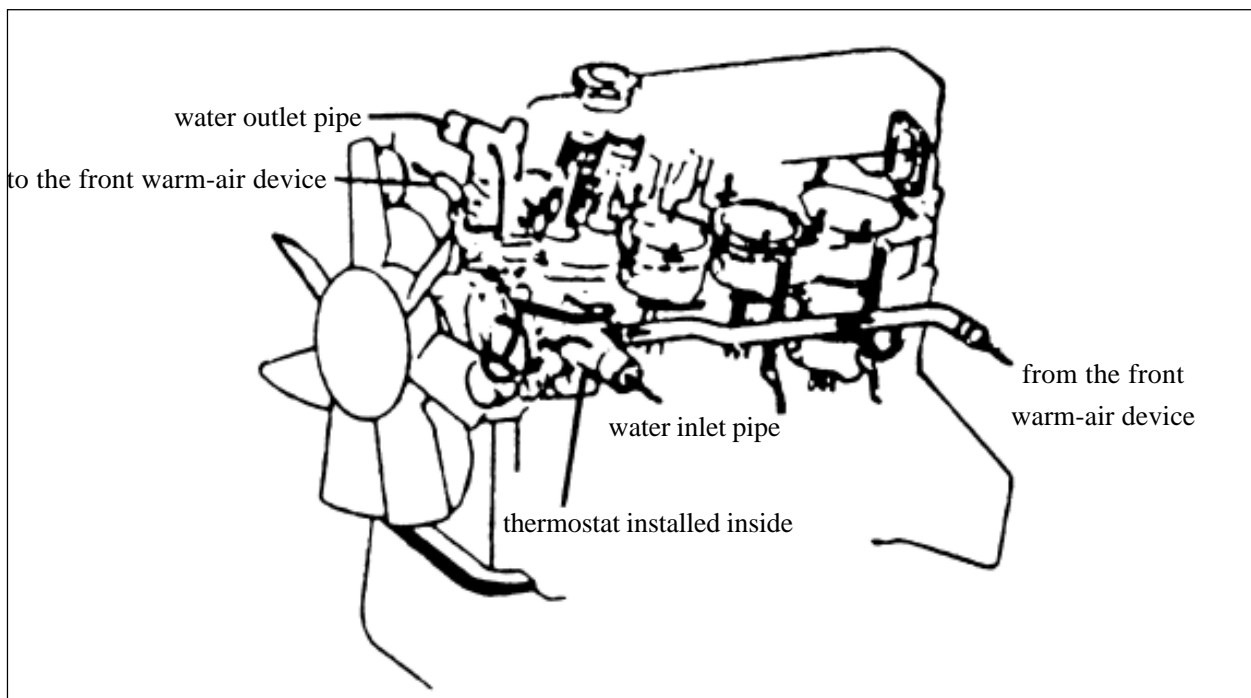
Cotton cloth may be used to clean sealing band on the plane of cylinder head, after which valve chamber cover will be installed onto three bolts used to fix rocker-shaft for cylinder head; when the rubber sealing ring on the bottom of valve chamber cover is facing exactly to sealing band on the plane of cylinder head, components like bolt & washer used to fix three valve chamber covers will be installed onto the fixing bolt of rocker-shaft, followed by a fixing with three cap nuts, plus a tightening made from the middle to two ends.

Tightening torque: $(5 \pm 1)\text{N} \cdot \text{m}$

Composition & characteristics of cooling system

The cooling system provided for engine is used to emit an appropriate amount of heat produced by each part and component of engine in a timely and forcible manner, so that engine may work continuously under a best temperature condition. For vehicles having air condition, the cooling system may provide heat supply to the warm-air device as well.

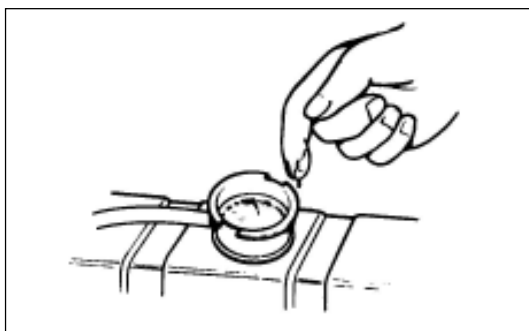
To improve the cooling effect and reduce the dissipation of coolant, Model 491QE petrol engine has been installed with one closed water cooling system having one automatic valve on the radiator cap: when engine is under a normal heat condition, the valve will be closed, making the pressure inside the cooling system slightly higher than atmospheric pressure so as to raise the boiling point of coolant; when the pressure inside the cooling system is too high or too low, the valve will be opened, making the cooling system ventilated with the atmosphere. Structure schematic diagram for cooling system as shown below:



Inspection /change of coolant inside engine

1. Check the level of coolant inside the standby coolant box.

The level of coolant shall be between the line "low" and the line "full". Check if there's any leakage when the level is too low, and refill coolant to the line "full"



2. Check the quality of engine coolant

(a) Ensure that there's no any rusted deposit or piece around the cap or the filling hole of radiator.

And it's unallowable to have machine oil mixed with coolant.

Preventive measures

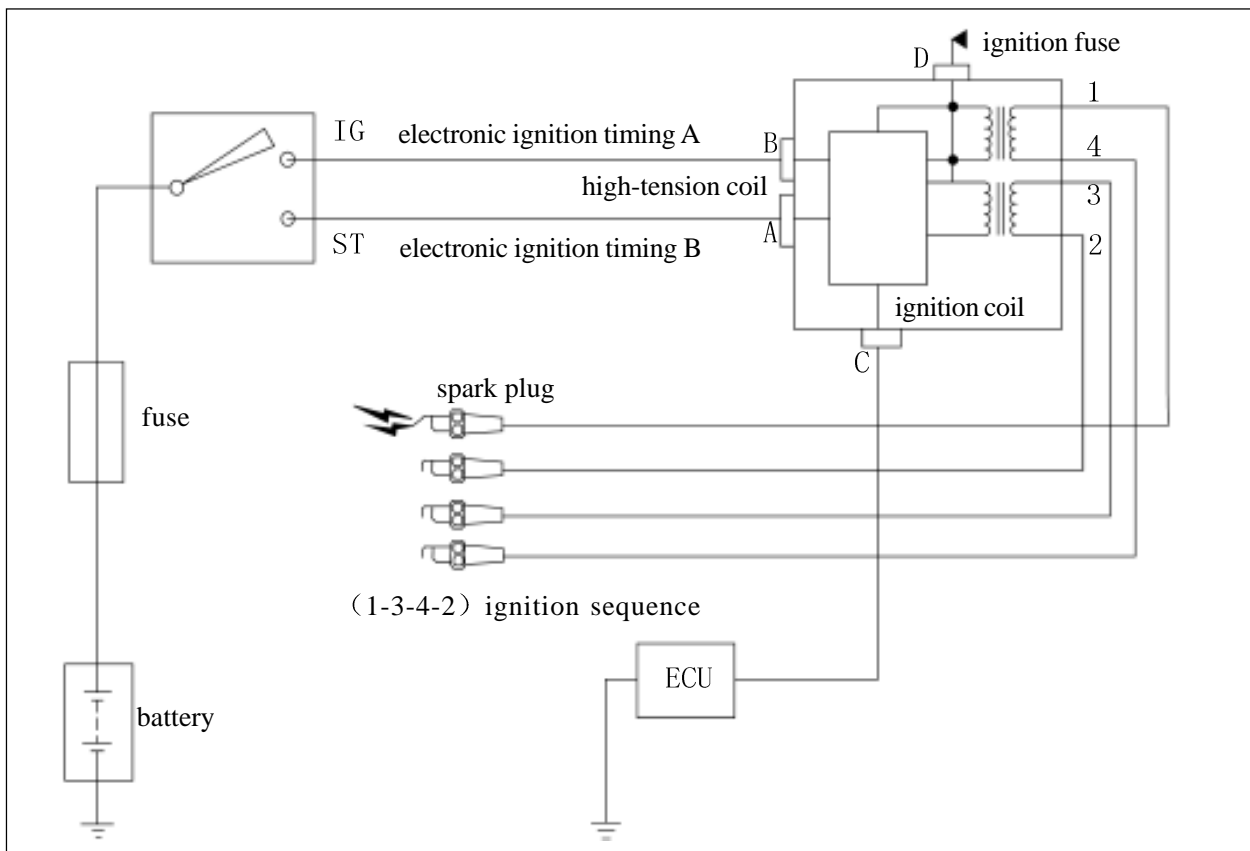
Great Wall automobiles are driven by petrol engine, which works after the mixture of petrol and air has been ignited by the high-voltage electric spark produced by one set of ignition system installed inside the engine. And the ignition system has such function as to transform the low-voltage provided by battery into a high-voltage current able to ignite the inflammable gas mixture inside engine cylinder; and to distribute the high-voltage current on time to the spark plug at each engine cylinder as per engine working procedure. And electric sparks produced between electrodes of spark plug will ignite the inflammable gas mixture to push the piston for actions, and to drive the connection rod of crankshaft, and to make the engine working.

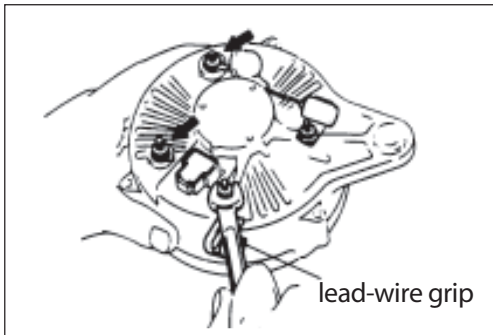
The preventive measures are given below:

- 1.If the engine can not be started, do not have the ignition key being connected for over ten minutes;
- 2.During the connection between system and the tachometer, the test line of tachometer shall be connected to the negative terminal of ignition coil;
- 3.To prevent any damage on igniter or ignition coil, do not have the terminal of tachometer contacted withground
- 4.Do not dismantle the battery while engine is running;
- 5.Always verify whether the igniter has been connected well with the cover.

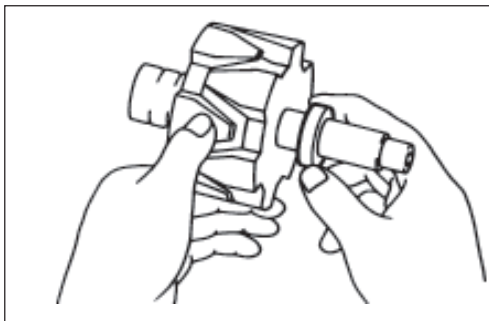
Ignition system-Circuit diagram /vehicle inspection of ignition system

Circuit diagram of ignition system as shown in the figure below:



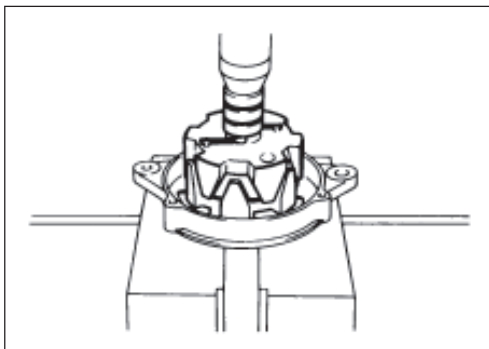


- (d) Put two terminal insulators onto the positive stud bolt of the rectifier frame.
- (e) Install the capacitor and the lead-wire grip.
- (f) Install four nuts.
- (g) Confirm that electrical wire has not been overlapped with the rectifier shell.

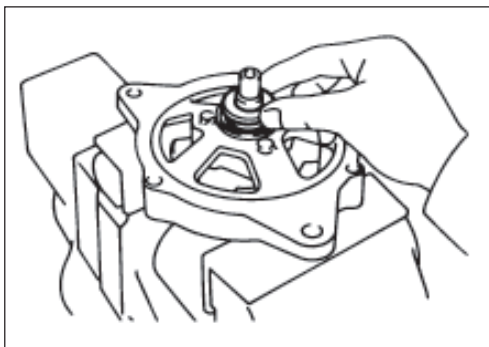


4. Installation of rotor

- (a) Insert spacer ring into the rotor shaft.



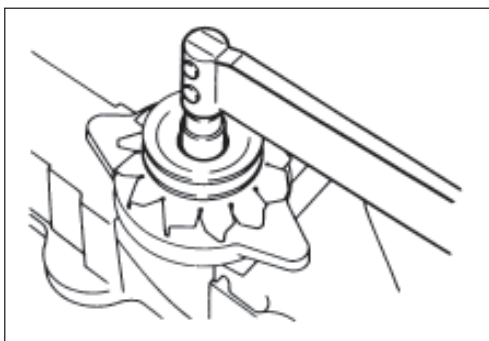
- (b) Use press tool to press rotor into the shaft.



5. Installation of fan and belt pulley

- (a) Fix the rotor onto soft-jaw vice.

- (b) Insert spacer ring into the rotor shaft.



- (c) Insert the fan, belt pulley, and spring washer successively into the rotor shaft.

- (d) Install and tighten the nut.

Tightening moment: $62.5\text{N} \cdot \text{m}$