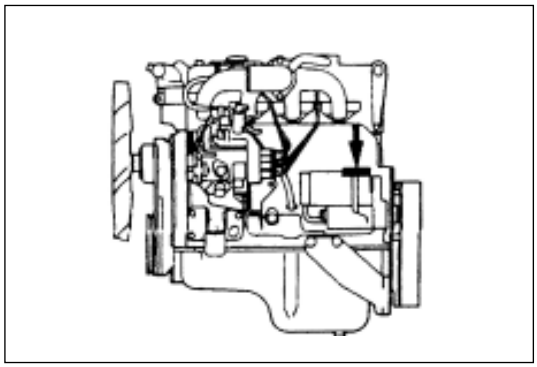
Model GW 4D28 diesel engine

Service Manual



Maintenance work

Attention:

Normal maintenance works shall be carried by qualified maintenance personnel.

Mark

Engine serial number

The serial number of the engine is stamped on the left side of front end of the engine body.

Air filter

Cleaning methods vary for different filter cores.

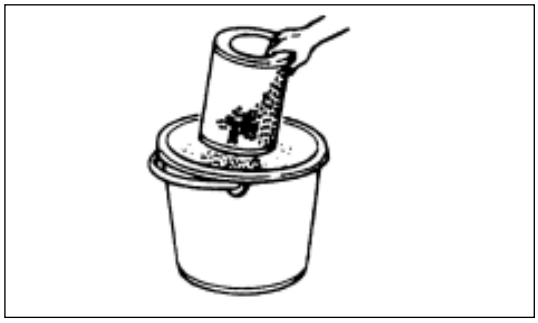
Filter core blockage by dust

Turn filter core by hand, at the same time blow air into the filter core, then the dust can be blown off.

The pressure of compressed air is 392 to 490kPa.

Attention：

Do not hit the filter core onto other objects for the purpose of cleaning; otherwise the filter core will be damaged.

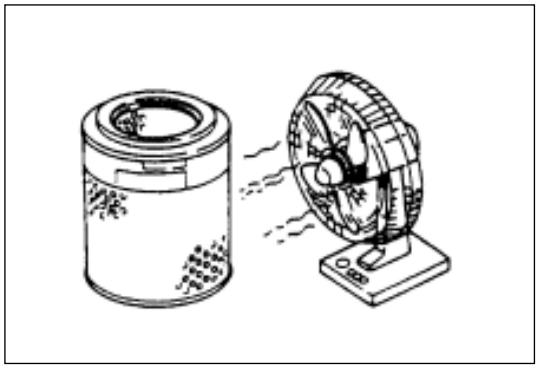


Filter core blockage with carbon and dust

(a) Prepare original air filter core cleaning solution produced by the Great Wall Car Company, and dilute it with water.

(b) Immerse the filter core into the cleaning solution for about 20 minutes.

(c) Take out filter core from clearner,make it well cleaned, water pressure should not exceed 274kpa



(d) Dry filter core in a well-ventilating site

Accelerate drying speed with electric fan.

Attention:

Do not accelerate drying process with compressed air or naked flame,or, the filter core will be damaged.

Normally, a filter core can be dried for two to three days, and then spare parts are needed at hand for temporary usage.

Pick the filter core out of cleaning solution and wash it with flowing water.

The water pressure shall not more than 274kPa.

Lubricating system

Main oil filter (paper type filter core)

replacement procedure

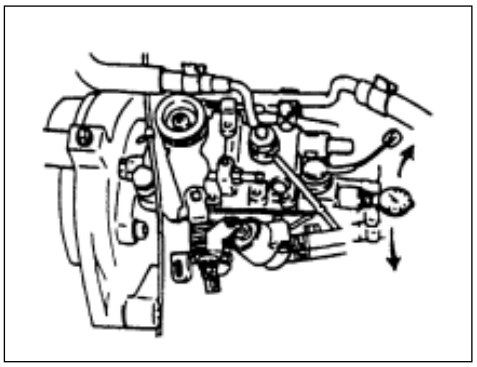
(f) Set the micrometer gauge on "0" position.
Measurement device: 5-8840-0145-0

(g) Turn the crankshaft right and left slightly, examine if the pointer of the micrometer is at the position of "0".

(h) Turn the crankshaft along operating direction and read out the measurement device when the crankshaft is at the top dead point.
The original timing reading is 0.5mm.

(i) If the oil injection surpasses prescribed range, continue to finish the next procedure.

(j) Loose locknuts and support bolts of oil injection pump.



(k) Adjust the assembly angle of oil injection pump.

- If set forward the oil injection timing, move the oil injection pump to the engine.
- If retard the oil injection timing, move the oil injection pump away from the engine.
- Screw down the retaining nuts, adjusting bolts and oil injection pump distributor top plug to prescribed torque.

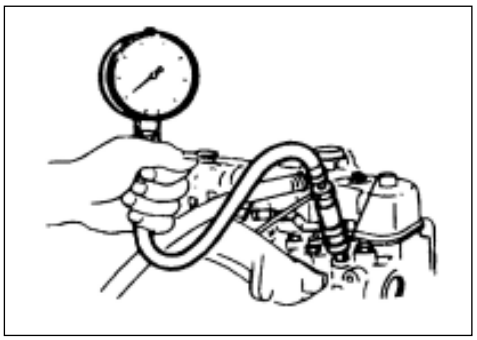
Screw down torque of oil injection pump retaining nuts is: 24N•m
Screw down torque of oil injection pump adjusting bolts is: 19N•m
Screw down torque of oil injection pump distributor top plug is: 54N・m
Attention: new copper carrier ring must be used when assemble distributor top plug.

Compressing pressure measure

(a) Start the engine and let it operate in idle speed until the coolant temperature reaches 70-80℃.

(b) Remove the following parts:

- All of the preheating plugs
- Fuel shutoff magnet coil plug board.
- Fuse of QOS(quick start system) on the plug board.



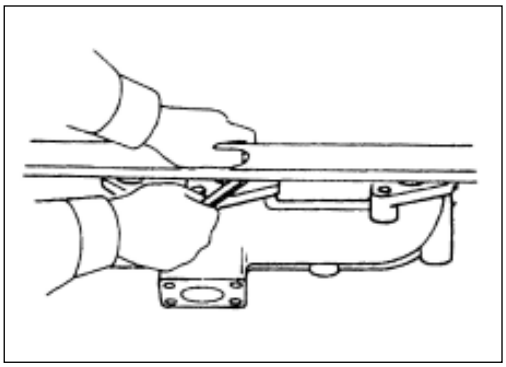
(c) Mount the joint and pressure gauge into the preheating plug hole of the first cylinder.

Compressing pressure gauge
Belt joint: 5-8840-2008-0-(J-29762)
Joint: 5-8531-7001-0

(d) Drive the engine with the starter and record the pressure gauge reading.

When the speed is 200r/min, the operating pressure is kPa

Standard	Limit
2942	2157



(6) Examine the mating surface of water jacket sealing plugs.

(7) Measure angularity of the mating surface between the exhaust manifold and the cylinder cover with a ruler and a feeler gauge.

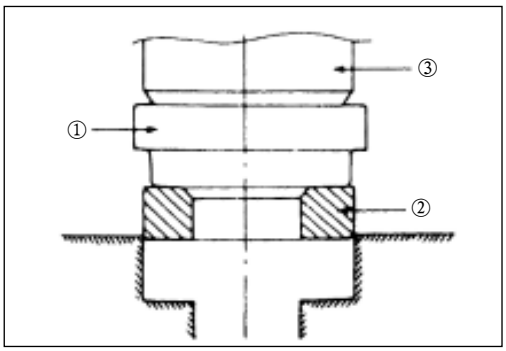
The mating surface shall be reground if the measurement value is between the prescribed limit value and standard value.

The exhaust manifold must be replaced if the measurement value exceeds the prescribed limit value.

Angularity of mating surface between the exhaust manifold and the cylinder cover .

mm

Standard	Limit
0.05 or smaller	0.20



Reassembly

1. Cylinder cover

(1) Assemble valve seat (cold-press assembly)

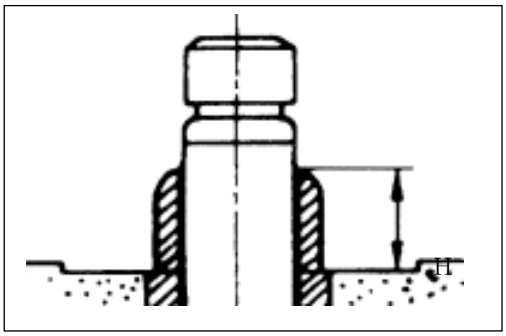
(a) Mount the accessory ① (its outer diameter less than the valve seat) onto the valve seat ②.

Attention: the mating surface with the valve seat must be the smooth surface of the accessory.

(b) Press the accessory gradually with table press to force the valve seat in position.

Attention:

The force exerted by the table press should not in excess, or the valve seat will be damaged.

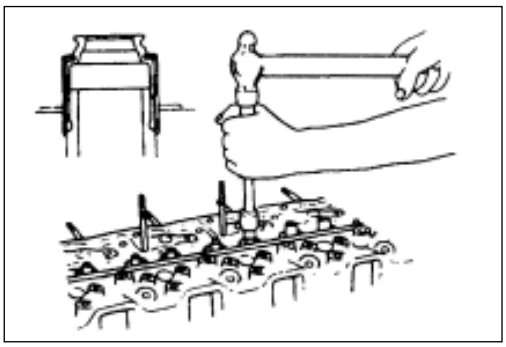


(c) Measure the installation height of valve guide pipe from one side of the cylinder cover top surface.

Height H (reference): 13mm.

Attention:

If the valve guide pipe has been disassembled, the valve and valve guide pipe must be replaced as a pair.



(2) Valve

Smear machine oil on the outer diameter of the valve rod before valve installation.

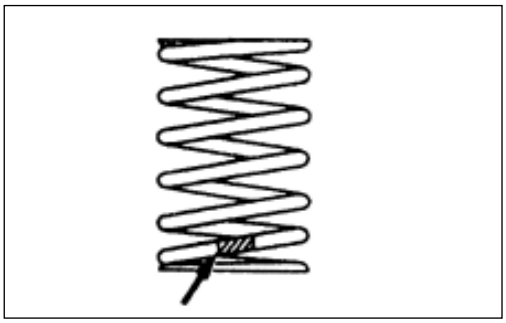
(3) Spring washer

(4) Air valve oil seal

(a) Mount new oil seal onto the valve guide pipe.

(b) Pull in it with special tool.

Valve oil seal erecter: 5-8840-2033-0



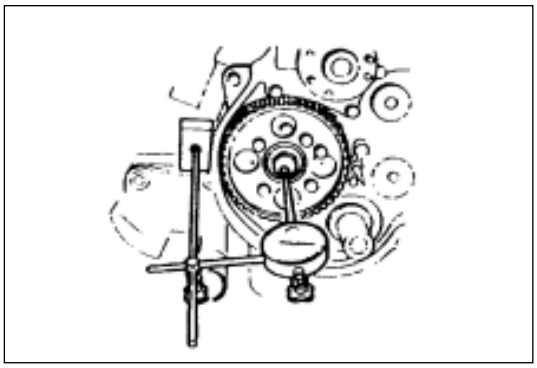
(5) Air valve spring

(a) Mount valve spring onto the spring washer.

(b) Mount valve spring seat onto the spring washer.

Notes:

- The end of the valve spring applied with paint shall be downward.
- Introduce compressed air from the preheating plug hole to the cylinder forcing valve in position.



Camshaft

1. Camshaft axial clearance

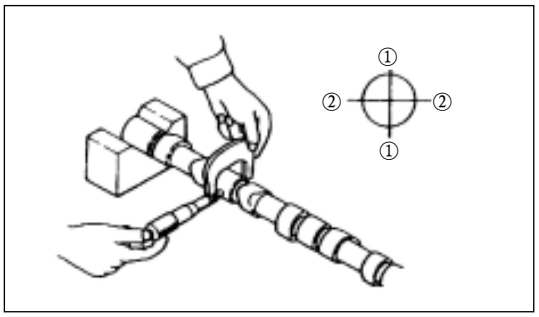
Measure the camshaft axial clearance with a dial gauge.

This task must be carried out before disassembling camshaft timing gear.

The thrust plate must be replaced if the axial clearance of camshaft exceeds the prescribed limit value.

camshaft axial clearance mm

Standard	Limit
0.08	0.20



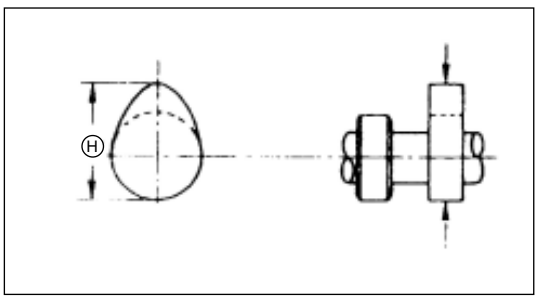
2. Camshaft outer diameter

Measure the camshaft outer diameter in two direction ① and ② with spiral micrometer.

The camshaft must be replaced if the measurement value is under the prescribed limit value.

Shaft outer diameter mm

Standard	Limit
49.945-49.975	49.600



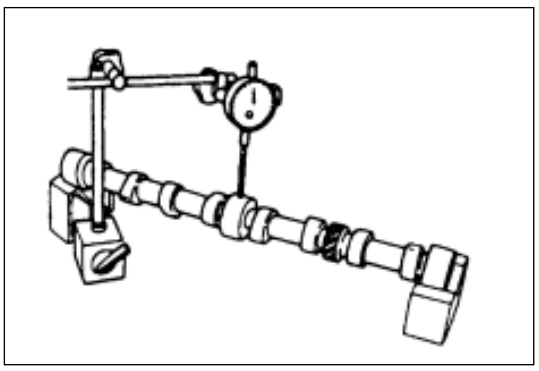
3. Cam height

Measure the camshaft height H with a micrometer.

The camshaft must be replaced if the measurement value is under the prescribed limit value.

cam height mm

Standard	Limit
42.02	41.65



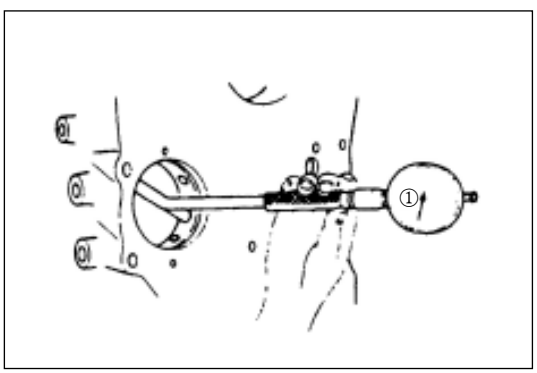
4. Camshaft radial jumping

(a) Put the camshaft on the V-type block.

(b) Measure the camshaft axial jumping with a dial gauge. The camshaft must be replaced if the measurement value exceeds the prescribed limit value.

Radial jumping mm

Standard	Limit
<=0.02	0.10



5. Camshaft bearing clearance

Measure the inner diameter of the camshaft bearing with an inner diameter micrometer.

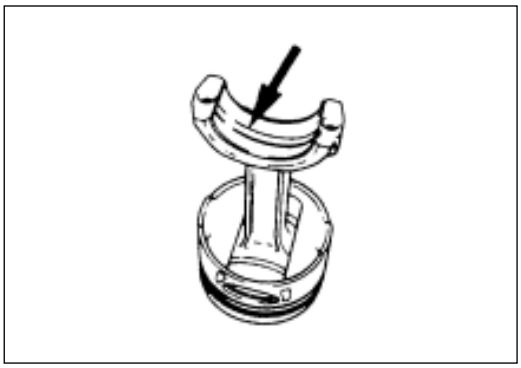
Camshaft bearing inner diameter mm

Standard	Limit
50.00-50.03	50.08

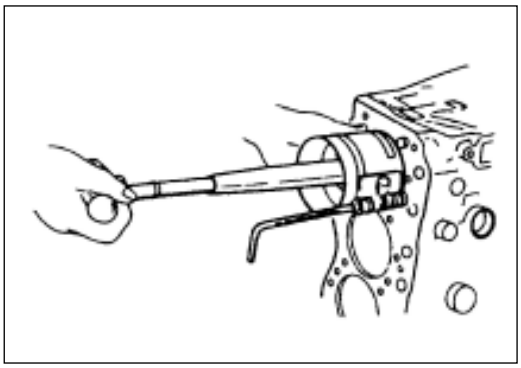
Camshaft bearing clearance mm

Standard	Limit
0.025-0.085	0.12

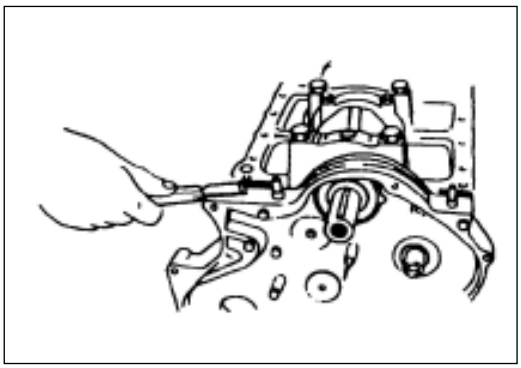
The camshaft bearing must be replaced if the camshaft bearing clearance exceeds the prescribed limit value.



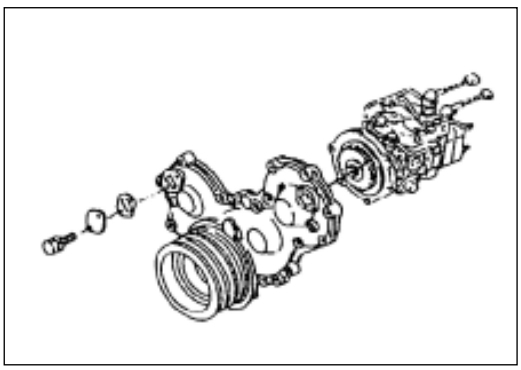
6. Piston and connecting rod assembly
   (a) Mount the connecting rod bearing onto the connecting rod body and its bearing cover.
   (b) Smear the cylinder bush hole, connecting rod bearing and the crankpin with new engine oil.
   (c) Examine if the opening position of piston ring is correct.



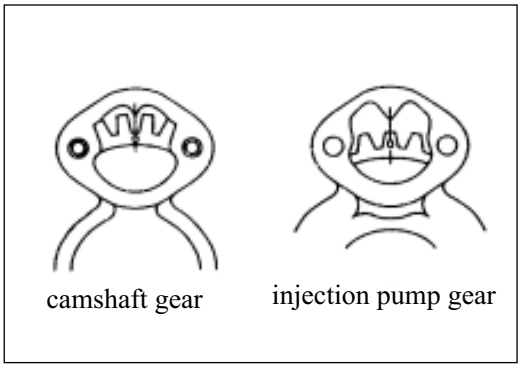
   (d) Mount the piston and connecting rod assembly into the cylinder with a piston ring compressor.
   Place the piston and connecting rod in position, the front marks on top of the piston and connecting rod must face the direction of engine.



7. Engine oil pump assembly
   (See page EM-17)
8. Timing gear chamber
   (a) Mount the timing gear chamber onto the engine body.
   Attention:
   Take care not to twist front oil seal.
   (b) Screw down fixing bolts of the timing gear chamber and its gasket to prescribed torque.
   Tighten torque: 19N • m
   (c) Cut off the projection part on the gasket of joint surface.



9. Injection pump assembly
   (a) Install examination whole covers on the camshaft gear side in gear chamber, timing gear side of oil injection pump.
   (b) Turn the crankshaft clockwise and examine if the TDC scratch in the crankshaft pulley aligns with the pointer. Put the piston in the first cylinder to compression travel top dead point.
   (c) Examine if the mark ìOî scratch on the camshaft timing gear aligns with the pointer in the inspection hole through inspection hole on the camshaft timing gear side.
   (d) On above mentioned conditions, align the mark ìOî of oil injection pump with the inspection hole pointer and mount oil injection pump assembly.
   (e) Mount the fastening bolts of the oil injection pump assembly and screw down to prescribed torque.
   Tighten torque: 20N • m



Inspection and maintenance

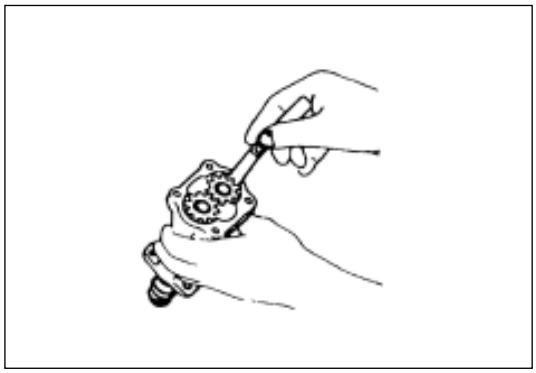
Parts must be adjusted, repaired or replaced when excess wear or damage is found in examination.

Casing and gears

The machine oil pump assembly must be replaced if following conditions are found in examination.

(a) Excess wear or damage of driven gear shaft bush.

(b) Excess wear or damage of gear teeth.



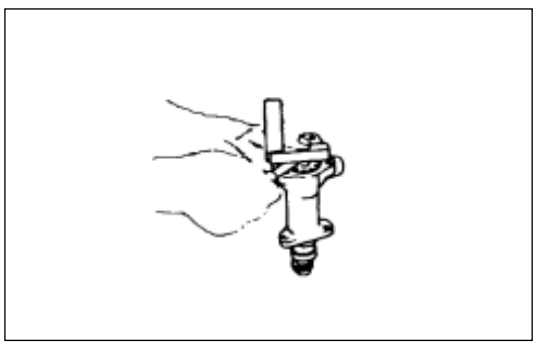
Gap between gear top tooth and the casing inner surface

(a) Measure the gap between gear top tooth and the casing inner surface with a feeler gauge.

(b) Either the gear or the casing must be replaced if the gap between gear top tooth and the casing inner surface exceeds limitation.

Gap between gear top tooth and the casing inner surface mm

Standard	Limit
0.14	0.20



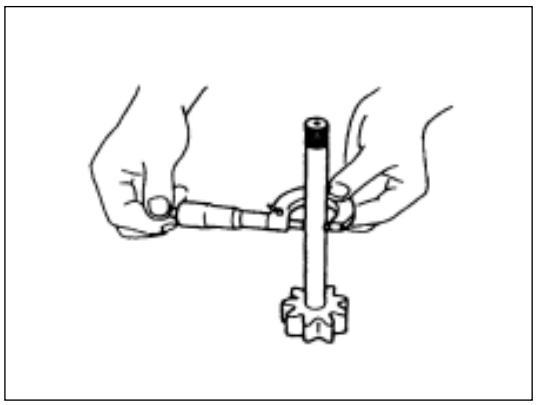
Gap between the pump cover and the gear

(a) Measure the gap between the pump cover and the gear with a feeler gauge.

(b) The casing must be replaced if the gap between the pump cover and the gear exceeds the prescribed limit value.

Gap between the pump cover and the gear mm

Standard	Limit
0.06	0.15



Gap between the driving shaft and the machine oil pump body

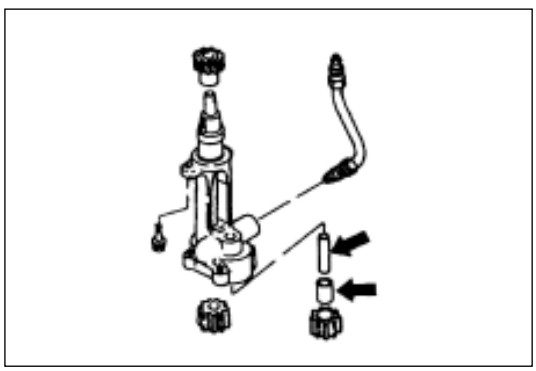
(a) Measure the outer diameter of driving shaft with a spiral micrometer.

(b) Measure the inner diameter of the pump body with an inner diameter micrometer.

(c) The machine oil pump assembly must be replaced if the gap between the driving shaft and the machine oil pump exceeds the prescribed limit value.

Gap between the driving shaft and the machine oil pump body mm

Standard	Limit
0.04	0.20



Gap between the driven shaft and the bush

(a) Measure the outer diameter of driven shaft with a spiral micrometer.

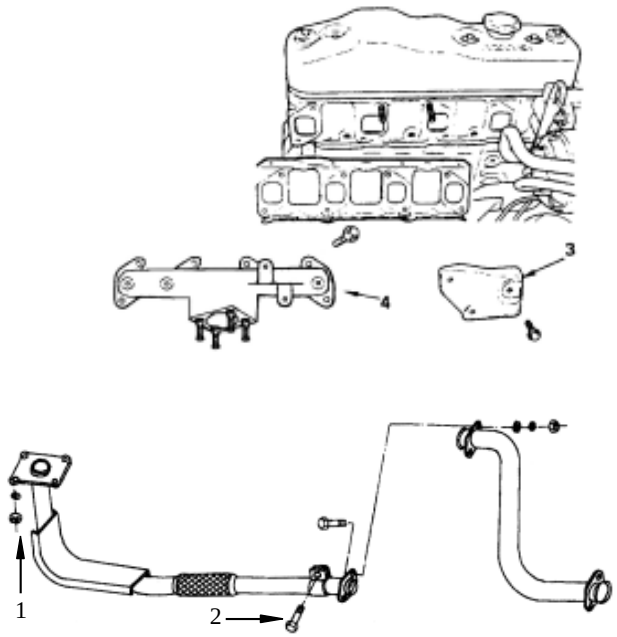
(b) Measure the inner diameter of the bush with an inner diameter micrometer.

(c) The bush must be replaced if the gap between the driven shaft and the bush exceeds the prescribed limit value.

Gap between the driven shaft and the bush mm

Standard	Limit
0.05	0.15

Exhaust manifold



Assembly sequence

1. front exhaust pipe fixing nut
2. fixing bolt of the front exhaust pipe mounting bracket
3. heat insulation board
4. exhaust manifold

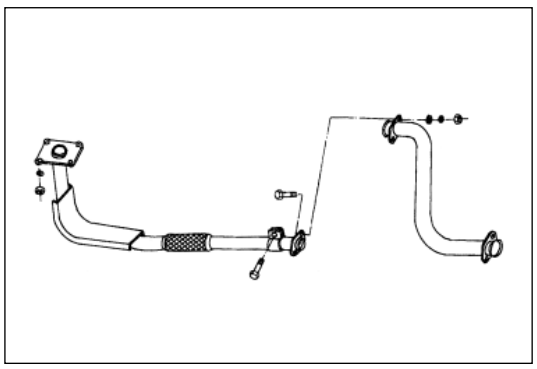
Assembly sequence

Carry out assembly in the reverse order of disassembly

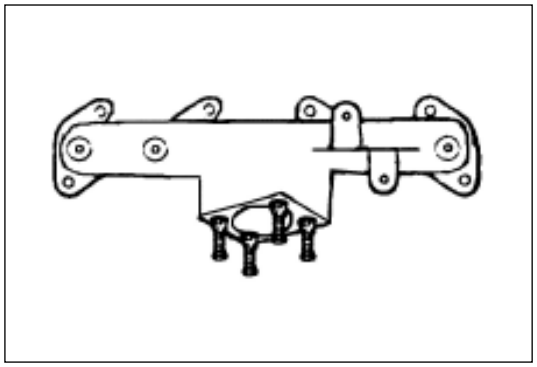
Disassembly

Preparation work

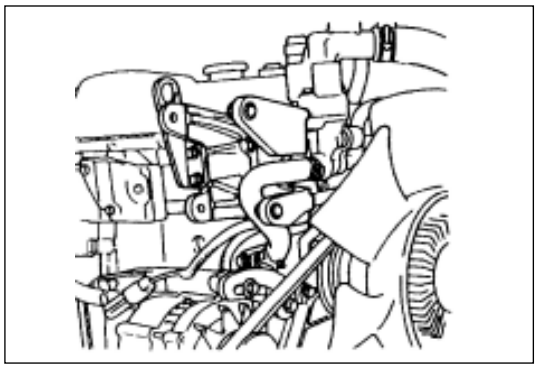
- Break the grounding cable of the storage battery



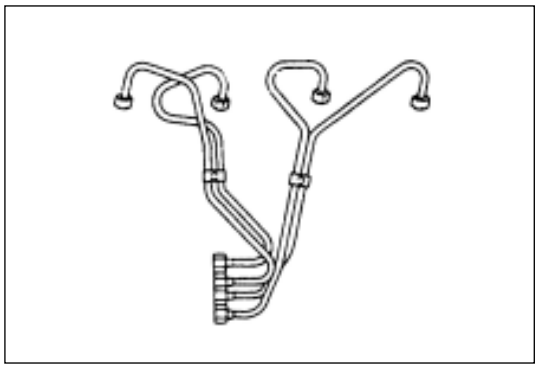
1. Front exhaust pipe fixing nut
   Demount two fixing nuts from the joint of the intake manifold and front exhaust pipe
2. Fixing bolt of the front exhaust pipe mounting bracket



3. Heat insulation board
4. Exhaust manifold
   Demount the fixing bolts and nuts of the exhaust manifold, and then disassemble the exhaust manifold and its sealing washer.



5. By-pass hose



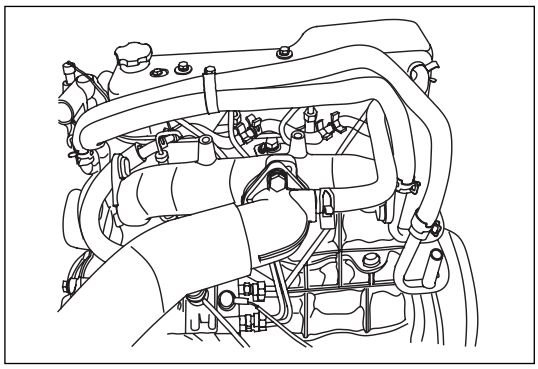
6. Fuel injection pipe
   (a) Release the turnbuckle of the fuel injection pipe
   (b) Release the conical nuts at the side of the injection pump
   (c) Unscrew the conical nuts at the side of the injector and disassemble the fuel injection pipes

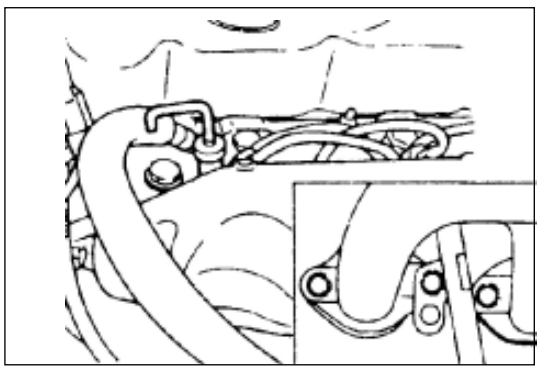
   Note:

   Plug up the orifices of the injector and the delivery valve to prevent foreign substances from entering them.
7. Oil return hose

   Disassemble the oil return hose at the side of the injector
8. Crankcase vent hose

   Remove the crankcase vent hose from the intake elbow
9. Preheating plug connecting panel

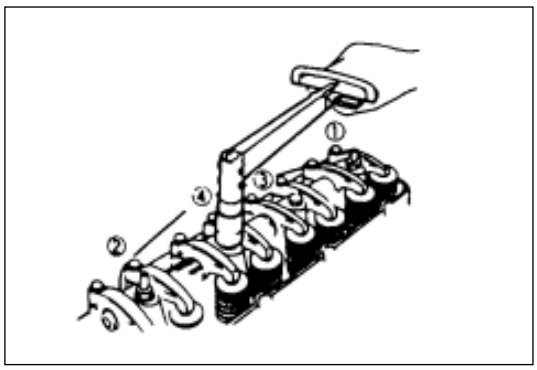




10. Engine oil measuring scale guide pipe

    Remove the engine oil measuring scale guide pipe from the cylinder cover

11. Cylinder cover cap



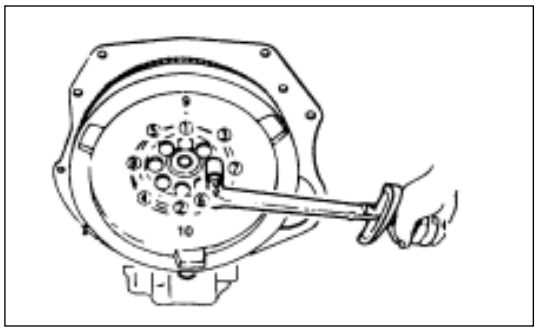
12. Rockshaft assembly

    Release bracket bolts of the rockshaft, a little each time. The sequence is shown in figure

    Note:

    If the rockshaft bracket bolts are not unscrewed a little each time, the rockshaft may be damaged

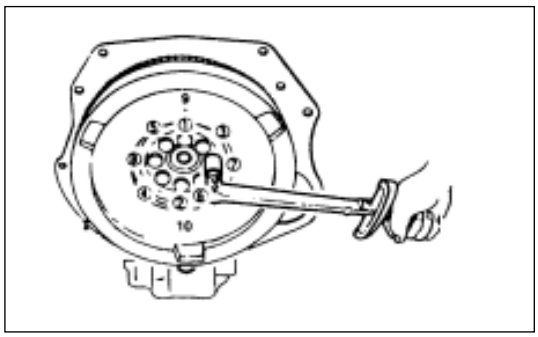
13. Tappet



3. Flywheel

(a) Assemble flywheel retaining device

(b) Unscrew fixing bolts of the flywheel and then disassemble the flywheel



Assembly

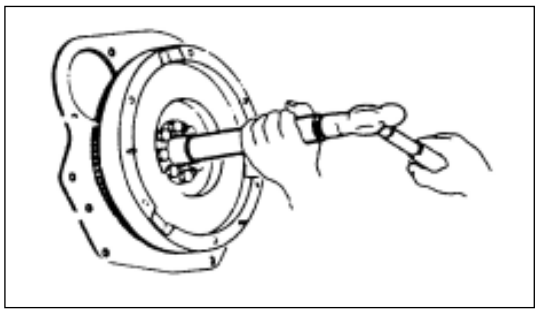
1. Flywheel

(a) Cover the flywheel bolts with engine oil

(b) Tight flywheel bolts to the specified torque in two steps with angle-tight method, and the sequence is shown in figure.

flywheel bolt torque N • m

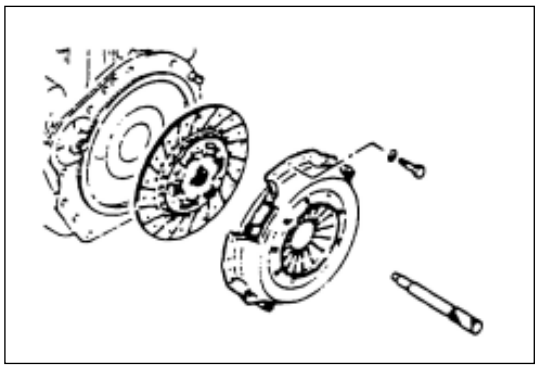
The first step(pre-tighten torque)	The second step(final bolt torque)
59	60-90°



2. Transmission primary shaft front-bearing

Install the transmission primary shaft front-bearing with a bearing assembler

bearing assembler of the transmission primary shaft front bearing:5-8522-0024-0



3.

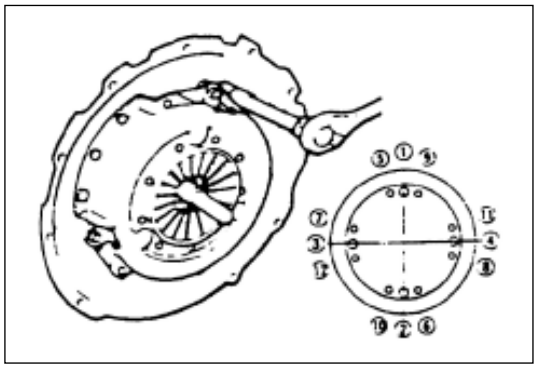
(1) Clutch

1) Clutch plate assembly

(a) Cover multiple spline of clutch plate hub with multifunctional molybdenum disulphide grease

(b) Mount the clutch plate assembly with a guiding plummet

guiding plummet：5-5825-3001-0



2) Platen assembly

(a) Tight platen assembly fixing bolts in the order shown in figure to the specified torque

screw down torque :18N • m

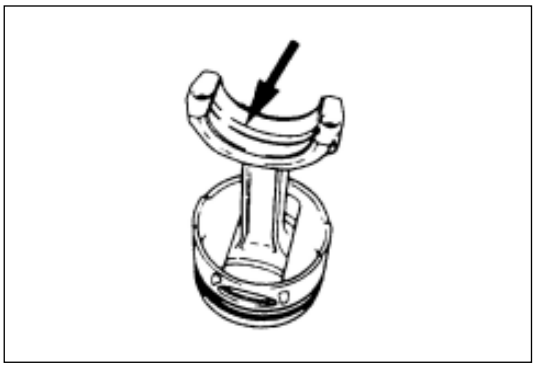
(b) Detach the guiding plummet

Note:If a new platen is installed,after tighting the planten fixing bolts to the specified torque,the wire guarding the diaphragm spring must be detached

(2) Transmission assembly

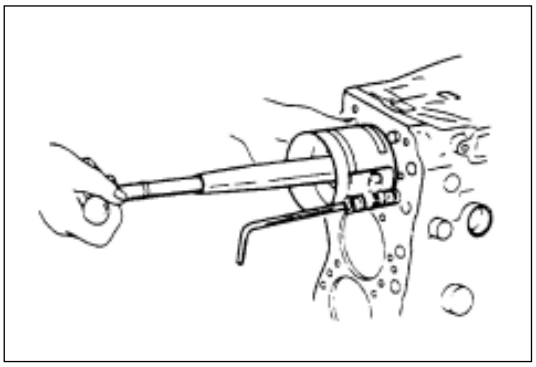
(a) Assemble the transmission assembly

(b) Install the propeller-shaft



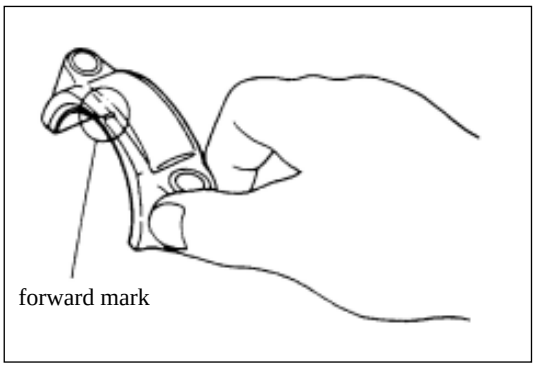
(1) Eliminate carefully all kinds of sundries on the back of rod bearings and fitting surface of the rod bearings

(m) Cover the upper bearing surface with engine oil
Cover the cylinder wall with engine oil

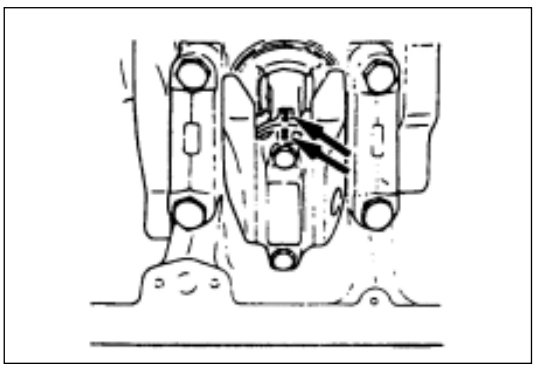


(n) When installing the piston, the forward mark at the top should be directed toward the frontage of the engine
Compress the piston ring with a piston ring compressor
piston ring compressor:5-8840-99018-0（J-8037）

(o) Push the piston into the cylinder with hammerís shaft,till the connecting rod contacts the crankpin.
At the same time rotate the crankshaft till the crankpin locates at the bottom dead center(BDC)



2. Connecting rod bearing cap
   (a) When assembling, the forward mark on the bearing cap should be directed toward the frontage of the engine
   (b) Install the connecting bearing cap
   Align the cylinder serial number mark on the rod bearing cap with the cylinder serial number mark on the connceting rod



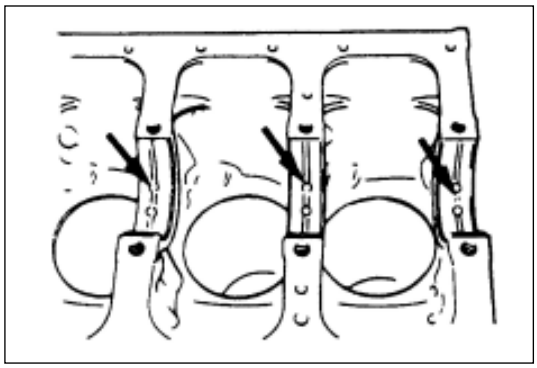
(a) Cover the screws of the rod bearing cap bolts and the fitting surfaces with engine oil
(b) Tight the rod bearing cap bolts to the specified torque with angle-tight method in two steps,

Rod bearing cap nut torque N · m

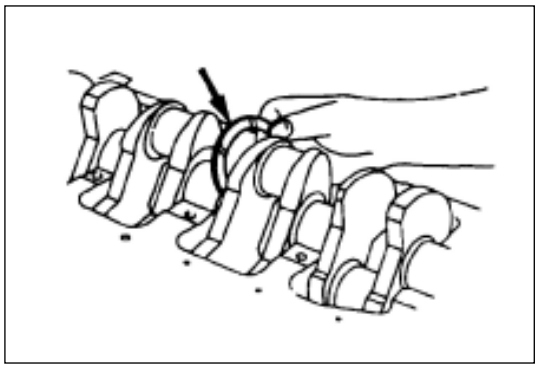
the first step(pre-tighten torque)	the second step(final torque)
45	60-90°

Note:
Rotate the crankshaft manually and check whether the crankshaft spins freely

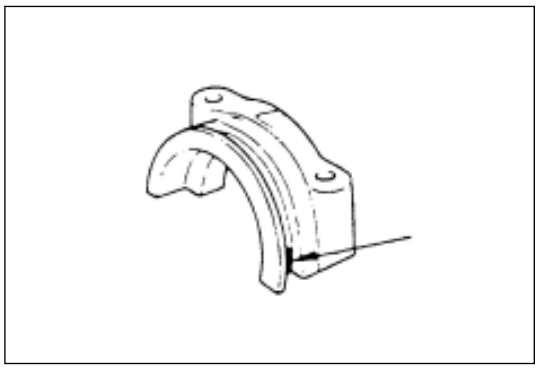
3. Engine oil pump assembly
   (see page EN-33)
4. Oil pan assembly
   （see page EN-33）
5. Cylinder cover assembly
   (see page EN-20)



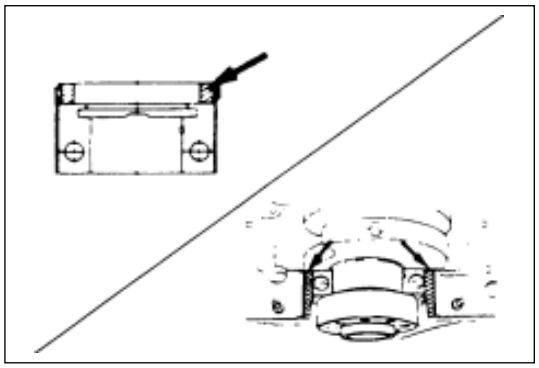
(d) Install the crankshaft main bearing to the housing and main bearing cap .
The main bearing must be installed in the right position
(e) Assemble the crankshaft carefully



(f) Cover the thrust plate with engine oil
(g) Install the thrust plate to the third maneton
The oil groove of the thrust plate must be directed toward the crankshaft



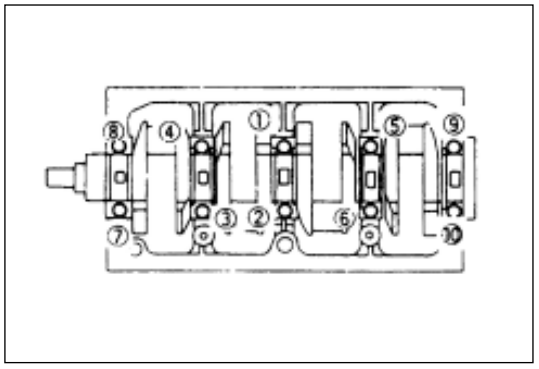
(h) Cover the fifth bearing cap of the crankshaft with recommended fluid sealant or its equivalent,shown in figure



(i) Cover the fitting surfaces of fifth bearing cap and housing with recommended fluid sealant or its equivalent,shown in figure

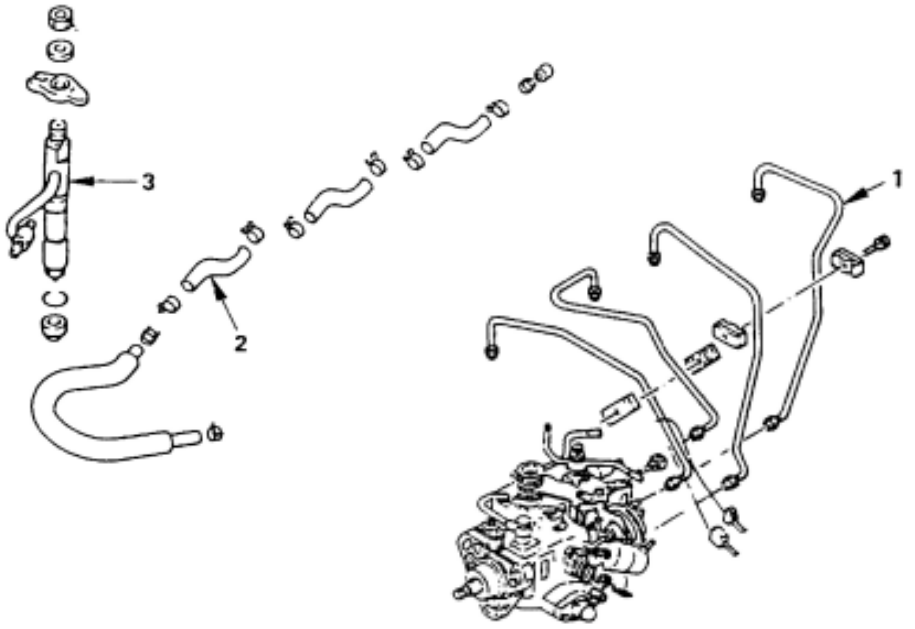
Note:
Before smearing liquid sealant,the main bearing fitting surface must be clean from even a drop of engine oil
Do not let fluid sealant block threaded holes and bearings

(j) The arrow mark at the top of each bearing cap must be directed toward the frontage of the engine when mounting main bearing cap
(k) Oil each bolt of the crankshaft main bearing cap
(1) Tight the crankshaft main bearing cap bolts to the specified torque,a little each time,and the sequence is shown in figure
Screw down torque: 167N • m



Note:
Rotate the crankshaft manually and check whether the crankshaft spins freely

The injector



Disassemble order

1. high pressure oil pipe
2. oil return pipe
3. injector

Assemble order

The assemble order is adverse to the disassemble order.

Disassemble

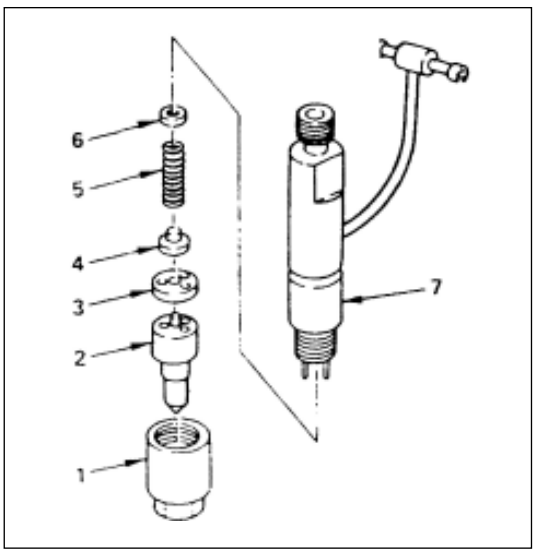
Preparing work

Cut off the earth wire of battery.

1. High pressure oil pipe
   (a) Loosen the high pressure oil pipe fastener.
   (b) Loosen the conical nut of the injection pump.
   (c) Loosen the conical nuts of the injection pump, and remove the high pressure oil pipe and keep it in place.
2. Oil return pipe
3. Injector

Check and repair

(a) Install the injector on the tester.
(b) When the oil pressure is 18142.3KPa, check the injector head there is any leakage.
Change it if there is any leakage.



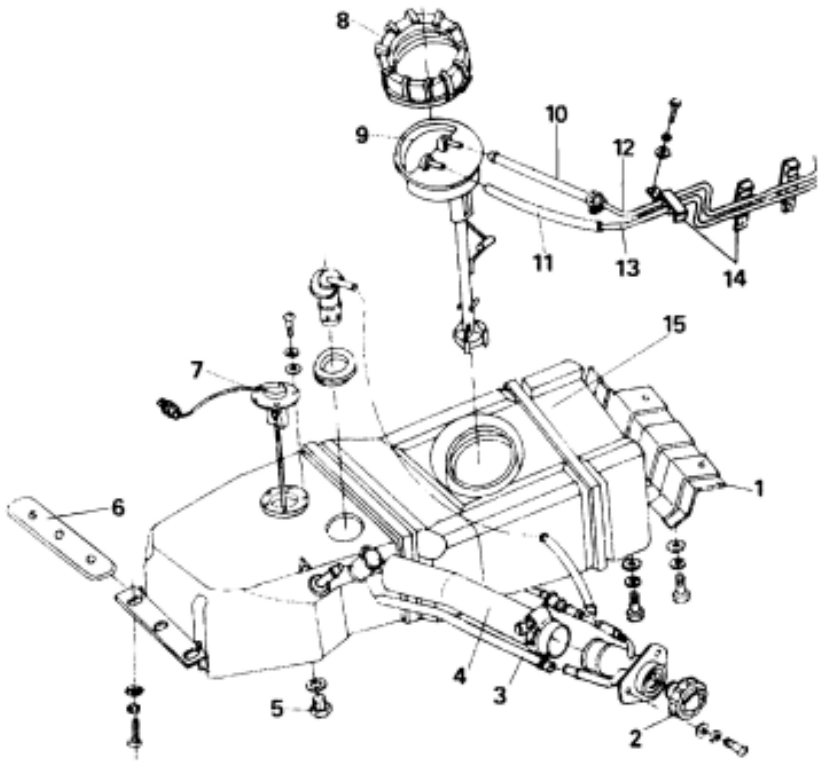
Disassemble

1. Clamp nuts
2. Injector nozzle matching parts
   (a) Disassemble every part from the injector body.
   (b) Label all the injector body and every part in order to set back when assembled.

   Notice:

   Do not change the combination of injector body and its parts.
   (c) Put the injector into a tool pan filled with clean diesel in order to guard dust.

Fuel tank



Disassemble order

1. guard plate of fuel tank
2. cap fastener of tank filler
3. air hose of tank filler
4. hose of tank filler
5. oil drain block
6. fuel tank cushion
7. fuel sensor
8. tank cap
9. filter screen
10. fuel tank outlet hose
11. oil return hose of fuel tank
12. fuel tank outlet pipe
13. oil return pipe of fuel tank
14. three-lined oil pipe fastener
15. fuel tank

Assemble order

The assemble order is adverse to the disassemble order.

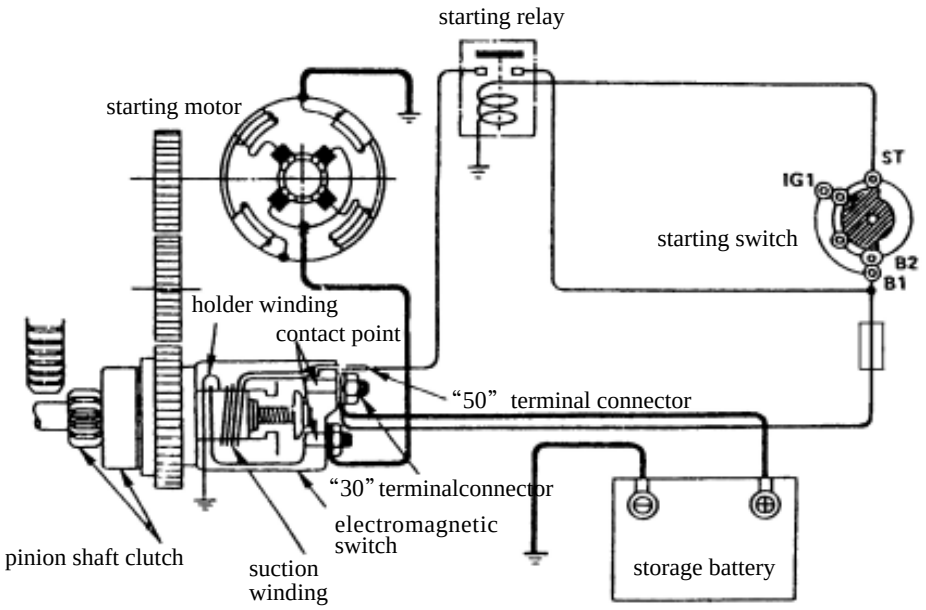
Disassemble

Preparing work

Cut off the earth wire of battery.

1. Fuel tank plate
2. Cap fastener of tank filler
3. Air hose of tank filler
4. Hose of tank filler
5. Oil drain block
   (a) Loosen the oil drain block and release the fuel.
   (b) After releasing the fuel, tighten the block to set torque.
   Tightening moment: 29N • m
6. Fuel tank cushion
7. Fuel sensor
   Block the oil pipe joint after remove the pipe from the engine, which can avoid leakage.
8. Tank cap
9. Filter screen
10. Fuel tank outlet hose
11. Oil return hose of fuel tank
12. Fuel tank outlet pipe
13. Oil return pipe of fuel tank
    Block the oil pipe joint after remove the pipe from the engine, which can avoid leakage.
14. Three-lined oil pipe fastener
15. Fuel tank

Summary



Starting system

Starting System is composed of storage battery, starting motor, starting switch, ignition lock, starting relay and so on. These components are connected as the diagram shown above, and it also can be used as the detailed specification of the starting circuit.

Starting motor

Starting system uses magnetic reduction motor; its bearing is also used as pinion shaft. when starting switch being closed, the magnetic switch contact point closes and causes the armature to rotate, attracts movable core and the tappet trundles the pinion shaft forward to mesh with ring gear at the same time ,then the ring gear rotates to starts the engine. When the engine starts up and the starting switch is unlocked, the movable core returns, the pinion disengages from the ring gear and armature stops rotating. The pinion runs without load while the speed of engine is much higher than which of pinion, so the armature isnít being driven.