FOREWARD

This maintenance manual is designed to serve as a reference for distributors of DHI.

To maintain the wheel loader in optimum condition and retain maximum performance for a long time, CORRECT OPERATION and PROPER MAINTENANCE are essential.

This manual is in detail explained about Specifications, Operation Principle, Diassembly, and Reassembly, Troubleshooting and Maintenance Standard. Therefore, when the machine goes wrong, repair the machine by correct procedure after reading this manual.

If you have any questionaire or recommendation in connection with this manual, please do not hesitate to contact our overseas service department or branch office in your territory.

DAEWOO HEAVY INDUSTRIES LTD.

CONTENTS

ENGINE

MAINTENANCE(D2366T)

SECTION 1

GENERAL INFORMATION

1. GENERAL REPAIR INSTRUCTIONS

1. The use of proper tools and special tools where specified, is important to efficient and reliable service operation.
2. Use genuine Daewoo parts.
3. Used cotter pins, gaskets, O-rings, oil seals, lock washers and self lock nuts should be discarded and new ones should be prepared for installation as normal function of the parts can not be maintained if these parts are reused.
4. To facilitate proper and smooth reassembly operation, keep disassembled parts neatly in groups. Keeping fixing bolts and nuts separate is very important as they vary in hardness and design depending on position of installation.
5. Clean the parts before inspection or reassembly. Also clean oil ports, etc., using compressed air to make certain they are free from restrictions.
6. Lubricate rotating and sliding faces of the parts with oil or grease before installation.
7. When necessary, use a sealer on gaskets to prevent leakage.
8. Carefully observe all specifications for bolt and nut torques.
9. When service operation is completed, make a final check to be sure service has been done properly.

2. GENERAL DESCRIPTION

Models D2366 is 6-cylinder, 4-cycle, in-line, vertical type engines. It is water-cooled and use Toroidal combustion system.

2.1 Engine Characteristics

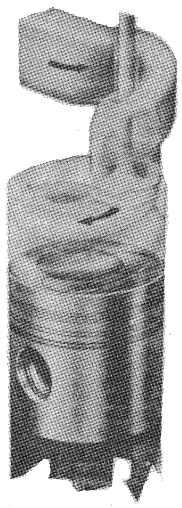
The engine operates according to the Toroidal combustion system developed by Daewoo Heavy Industrial Co. of Korea and AVL Co. of Austria.

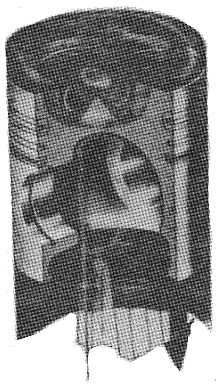
The main design features of this system are the combustion chamber arranged in the center of the piston and the swirling passage in the cylinder head.

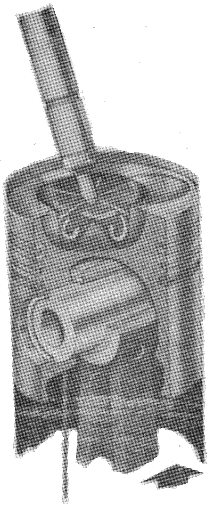
Due to the swirling passage, the air entering the cylinder through the helical port designed specially during intake stroke is imparted a strong rotary motion in the combustion chamber and the complicated turbulence motion created by the swirl produced during compression stroke and strong squish flow makes the fuel be mixed more sufficiently with air.

During power stroke the fuel injected from a multi-orifice nozzle is mixed sufficiently with air for complete combustion, so that the improvement of performance is achieved.

Engines with the Toroidal combustion system are characterized by their quiet running, high flexibility and very low specific fuel and oil consumption.







2.2 Main Specification

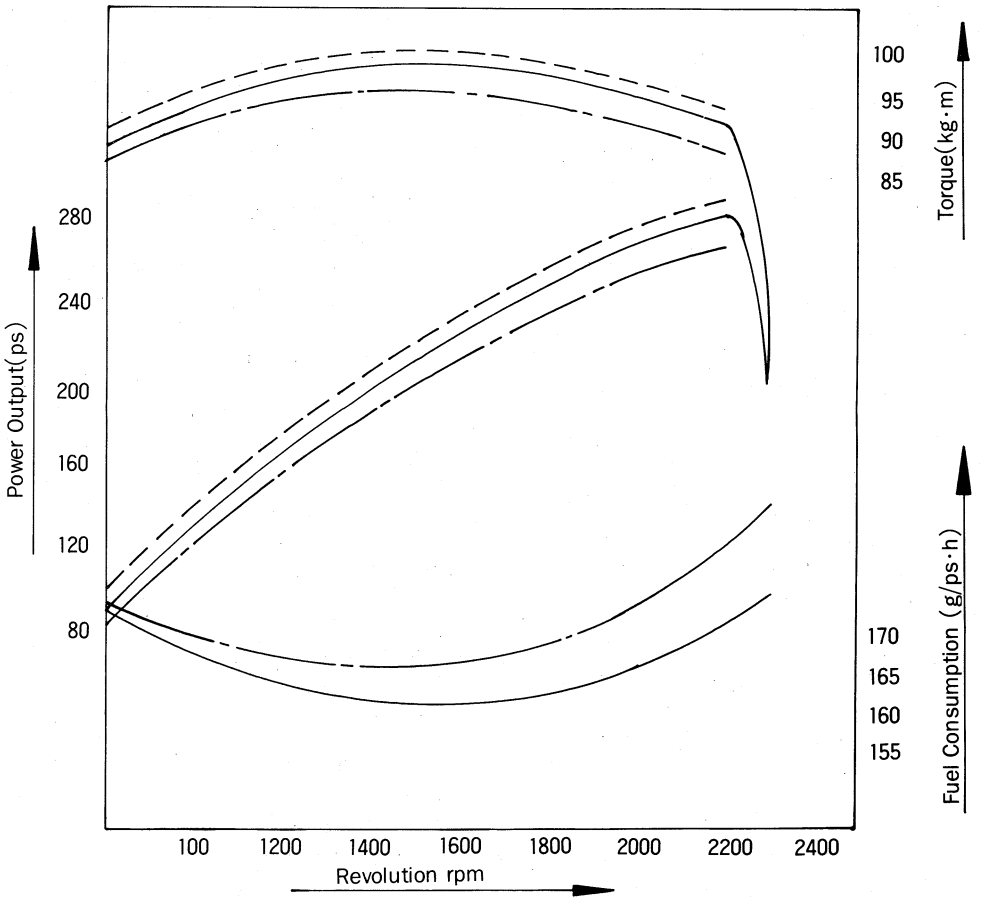
Item	Specification
Model	D2366T
Engine Type	Water-cooled, 4 cycle, in-line, vertical type
Combustion chamber Type	Toridal combustion chamber
Fuel Injection Type	Direct injection type
Cylinder bore×stroke(mm)−No. of Cylinder	123×155−6
Total displacement(cc)	11,051cc
Compression ratio	17.5 : 1
Rated output power	282ps/2,200rpm(without fan) 267ps/2,200rpm(with fan) 97.5kg·m/1,500rpm(without fan) 94.6kg·m/1,500rpm(with fan)
Fuel injection order	1−5−3−6−2−4
Injection pump type	NP−PE6P 120/721 RS 3000
Governor type	NP−EP/RFD 200/1650 PF9CHR
Timer type	NP−EP/SP600−1100Z 5.5R
Injection nozzle type	NP−DLLA 150SV 3117308
Feed pump type	NP−FP/KP
Intake valve open at close at Exhaust valve open at close at	BTDC 180° ABDC 34° BBDC 46° ATDC 14°
Oil pump type	Gear type
Oil cooler type	Water-cooled
Fuel filter type	Double filtering type with felt and paper element
Oil capacity(ℓ)	21
Coolant capacity(ℓ)	19
Thermostat type	Wax pallet
Allternator(V−A)	28V−65A
Starter(V−KW)	24V−5.4KW

2.3 Engine Performance Curve

Test	condition
Atmosphere	760mmHg
Warming up	Sufficient
Cooling fan	Separated type
Generator	Installed
Air cleaner	Installed
Muffler	Not installed

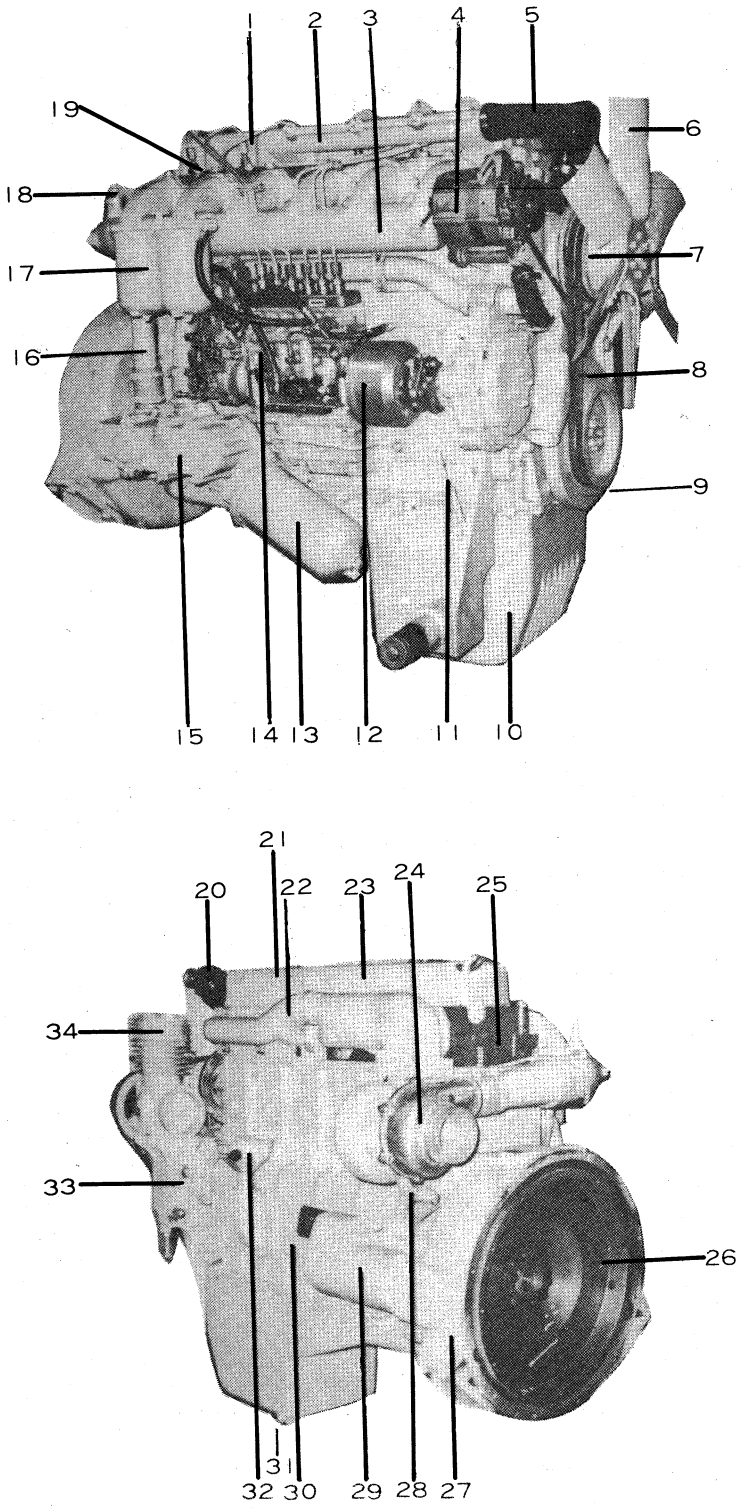
----- MAX. POWER & TORQUE

— — — WITH COOLING FAN (ϕ813mm)



Performance standard	KS-R1004	With fan
Output power (Max. Rated)	282PA/2200rpm	267ps/2200rpm
Max. torque	97.5k·m/1500rpm	94.6k·m/1500rpm
Consumption ratio(Min. Rated)	170g/ps·h	181.3g/ps·h

3.4 D2366T ENGINE



1. Fuel Pipe
2. Water Pipe
3. Intake Manifold
4. Alternator
5. Water Hose
6. Cooling Fan
7. Water Pump
8. V-Belt
9. Vibration Damper
10. Oil Pan
11. Oil Level Gauge
12. Timer
13. Oil Filter
14. Fuel Injection Pump
15. Oil Cooler
16. Water Pipe
17. Fuel Filter
18. Preheater Plug
19. Injection Nozzle
20. Thermostat
21. Oil Filler neck
22. Ex-Manifold
23. Cylinder Head Cover
24. Turbo Charger
25. Cylinder Head
26. Fly Wheel
27. Fly Wheel Housing
28. Oil Hose
29. Starter
30. Cylinder Block
31. Oil Drain Plug
32. Breather Pipe
33. Air Compressor Bracket
34. Air Compressor

SECTION 2

PREVENTIVE MAINTENANCE

INDEX

1. SERVICING OF ENGINE

1.1 General

Regular inspection and maintenance is the key to more efficient operation of the vehicle.
It is advisable to make judgement as to which components are in need of service attention by taking the following inspection and maintenance procedures into consideration before removing the engine from the vehicle for overhauling.

1.2 Inspection and Maintenance Procedure

1.2.1 Coolant

- Check the level of coolant in radiator by removing the radiator filler cap and replenish coolant if necessary.
- Check the pressure valve opening pressure using a radiator cap tester. Replace the radiator filler cap if the measured value deviates from the specified value.

Pressure valve opening pressure [kg/cm²]	0.5

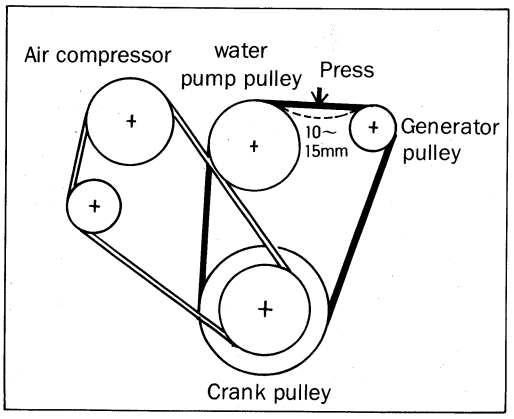
- Flush the cooling system using rain water or city water with cleanser.
- With begin of the cold weather season the coolant must be checked with a calibrated hydrometer for sufficient freeze protection and if necessary, antifreeze must be added as described below.

Anti-freeze solution(5)	Freezing Ponit(°C)
–	–
20	−10
27	−15
33	−20
40	−25
44	−30
50	−35

1.2.2 Fan Belt

- Check the belt for fraying or damage and replace with new one as necessary.
- Check the amount of fan belt deflection by applying a good finger pressure to the belt between the fan pulley and generator pulley. If the fan belt deflection is incorrect, adjust by pivotting the generator.

Fan belt deflection [mm]	About 10−15



1.2.3 Engine Oil

- Pull out the oil level gauge rod (oil dipstick), wipe clean and reinsert it. Again pull it out and check the oil level against the level mark. If the oil level is too low, replenish with specified engine oil.
- Check engine oil for deterioration. If engine oil is found to be deteriorated with coolant or fuel, check the cooling or fuel system to establish the cause of deterioration and give necessary service attention.
- Replace engine oil at specified intervals or when found to be fouled considerably. To drain, remove the drain plug from the oil pan while the engine is hot. Also drain the oil filter by removing the drain plug.

Engine oil change intervals[hours]	First 50 Every 250

• Lubricants should be carefully selected according to the recommendation. It is also important to select viscosity of lubricants according to the atmospheric temperature by referring to the following chart.

Atmospheric temperature	SAE No.
−30°C~ 0°C	SAE 10W
0°C~30°C	SAE 30
−30°C~30°C	SAE 10W30

1.2.4 Oil Filter

• Check the oil filter for leakage and correct as necessary.
• Replace the oil filter element at specified intervals.
To replace the element, drain the oil filter through the drain plug hole while the engine is hot, turn loose the center bolt, then remove the filter together with the body.

Oil filter element replacement intervals [hours]	Same as engine oil Change intervals

1.2.5 Fuel Filter

The fuel filter system is of the two-stage type with a felt element as a primary filter and a paper element as a secondary element.
• Paper element is noncleanable type and should be replaced at every engine oil changing intervals.
• Felt element should be cleaned every 500hrs and be replaced after 3 times of cleaning.

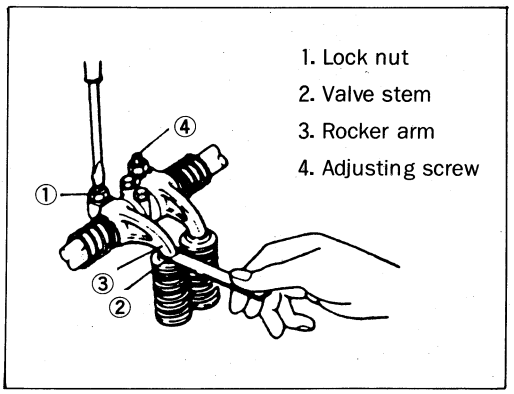
1.2.6 Air Cleaner

• Check the element for distortion or damage and air cleaner body for cracks distortion or broken seal. Clean, correct or replace parts as necessary.
• Clean and replace the air cleaner element according to element manufacturer's intructions.

1.2.7 Valve Clearance Adjustment

• After removing the cylinder head cover to measure the valve clearance. No. 6 cylinder valve should be completely opened by turning the crankshaft. Then, the piston in No. 1 cylinder is at the top dead center on compression stroke, and adjust the valve clearance of No. 1 cylinder.
• After releasing the lock nut to adjust the valve clearance, insert a feeler gauge of specified thickness into the clearance between the valve stem end and rocker arm, and adjust the clearance with the adjusting screw. Fully tighten the lock nut when a correct adjustment is obtained.

Valve clearance(at cold)[mm]	Intake 0.3 Exhaust 0.3



• When adjustment of the valves on the No. 1 is completed, turn the crankshaft 1 full turn and adjust the clearances of the valves on remaining cylinders.

Cylinder No.	1		2		3		4		5		6	
Valve arrangement	I	E	I	E	I	E	I	E	I	E	I	E
Adjustment order	○	○	○	●	●	○	○	●	●	○	●	●

Note : I ··· Inlet valve
E ··· Exhaust valve

- Adjust the clearance of the valves marked with ○ in the table when the piston in the No. 1 cylinder is held at the top dead center on compression stroke.
  Conversely, adjust the clearance of the valves marked with ● in the table when the piston in the No. 6 cylinder is held at the top dead center on compression stroke.

1.2.8 Cylinder Compression Pressure

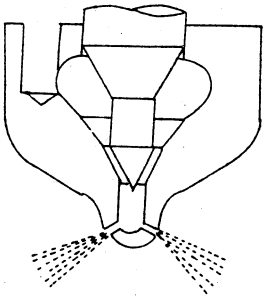
- Remove the entire nozzle holders after engine is warmed up.
- Mount the compression gauge adapter in position of nozzle holder and install the compression gauge.
- Measure the compression pressure in the cylinders with operating the starter motor.

Standard value	24~28kg/cm²
Limit for use	24kg/cm² or less
Difference between each cylinder	±10% or less

Condition : coolant temperature, 20°C
Engine rpm: 200r.p.m.

1.2.9 Fuel Injection Nozzle

- Check the nozzle injection pressure and spraying condition and make necessary adjustment at specified intervals.
- To make adjustment on the injection pressure, check the pressure with a nozzle tester and adjust the injection starting pressure to the specification (214+5kg/cm²) with the adjusting shim.



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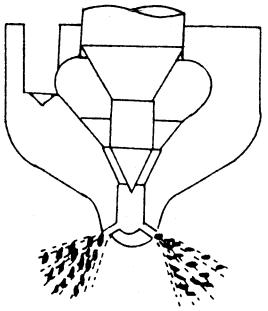

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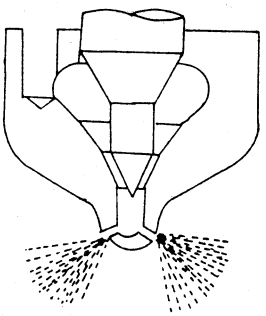


abnormal

1.2.10 Air Bleeding

If air is in the fuel system or after the fuel system service has been done, bleeding of the fuel system should be performed. The bleeding operations are as follows.

- Turn loose the air bleeder screws on the fuel filters, and manually operate the fuel priming pump on the fuel feed pump to bleed the air through the bleeder screw.
- After checking to make sure that the fuel system is completely bled, securely tighten the air bleeder screw of the first fuel filter and repeat the same procedure for the secondary fuel filter.
- After bleeding operation, make sure to screw in the fuel feed pump handle.

2. TROUBLESHOOTING

2.1 Hard-Starting

Complaint	Cause	Correction
Trouble in starter circuit Magnetic switch does not work when starter switch is turned on.	(1) Wrong connections, wire broken or loosely connected	Correct
	(2) Starter switch points defective	Replace
	(3) Magnetic switch coil open or burned out	Replace
	(4) Plunger shaft bent or binding.	Correct or replace
	(5) Pinion sticking	Correct or replace
Magnetic switch operates but pinion does not come into engagement with ring gear.	(1) Armature shaft bearings defective	Correct or replace
	(2) Pinion or ring gear teeth worn excessively or distorted	Replace
	(3) Battery under charged	Recharge or replace
	(4) Movement of pinion on shaft unsmooth	Clean
	(5) Plunger or contactor shaft sticking	Correct or replace
Pinion engages ring gear but starter motor does not turn over.	(1) Pinion clutch slipping	Replace
	(2) Armature field coil burned out	Replace
	(3) Brushes in poor contact with commutator	Correct or replace
	(4) Battery under-charged	Recharge or replace
	(5) Starter motor circuit poorly grounded	Correct
Trouble in fuel system Fuel not being pumped out from feed pump.	(1) Fuel tank empty	Replenish
	(2) Fuel tank strainer clogged	Clean
	(3) Fuel pipes clogged or air in fuel line	Correct
	(4) Feed pump valves defective	Replace
	(5) Feed pump piston or push-rod sticking	Correct or replace
	(6) Feed pump strainer clogged	Clean

Complaint	Cause	Correction
Fuel not being injected from injection pump.	(1) Fuel filter element clogged	Replace
	(2) Fuel filter overflow valve remaining open	Replace
	(3) Air in fuel filter or fuel pump	Bleed
	(4) Plunger or delivery valves sticking	Correct or replace
Fuel injection timing incorrect.	(1) Injetion pump not properly installed	Correct
	(2) Injection timing incorrect	Correct
	(3) Cams or camshaft worn excessively	Replace
Injection nozzles not working	(1) Needle valves sticking	Correct or replace
	(2) Fuel leaking past clearance between nozzle needle valve	Correct or replace
	(3) Injection pressure incorrect	Adjust
Compression pressure insufficient	(1) Cylinder head gasket broken	Replace
	(2) Piston, piston rings or cylinder liners worn	Replace
	(3) Piston rings seized up	Replace
	(4) Valve clearances incorrect	Adjust
	(5) Valve not properly seated	Lap valves and valve seats
	(6) Valve stem seized up	Replace
	(7) Valve spring(s) weakened or broken	Replace

2.2 Engine Runs Rough

Complaint	Cause	Correction
Rough engine idling	(1) Injection timing incorrect	Adjust
	(2) Injection pipes loosened	Tighten
	(3) Injection nozzle defective	Correct or replace
	(4) Volume of fuel injection unequal	Correct
	(5) Movement of control rack sluggish	Correct or replace
	(6) Operation of plungers unsmooth	Correct or replace

Complaint	Cause	Correction
	(7) Control pinions not engaged with control rack correctly	Correct or replace
	(8) Air in injection pump	Bleed
Engine runs rough at low and medium speed(hunting occurs)	(1) Governor idling spring binding	Correct or replace
	(2) Governor spring weakening	Correct or replace
Engine runs at high speed and does not stop	(1) Linkage or cable between accelerator pedal and injection pump binding	Correct
	(2) Injection pump control rack binding	Correct

2.3 Engine Lacks Power

Complaint	Cause	Correction
Engine lacks power continuity	(1) Valve clearances incorrect	Adjust
	(2) Valve poorly seated	Correct or replace
	(3) Cylinder head gasket defective	Replace
	(4) Piston rings worn or sticking	Replace
	(5) Injection timing incorrect	Adjust
	(6) Volume of fuel delivery insufficient	Adjust
	(7) Nozzle injection pressure incorrect or nozzle seized	Adjust or Replace
	(8) Feed pump defective	Correct or replace
	(9) Restrictions in fuel pipes	Correct
	(10) Volume of intake air insufficient	Service air cleaner
	(11) Clutch slipping	Adjust or replace
	(12) Brake dragged	Adjust or replace
Engine lacks power on acceleration	(1) Compression pressure insufficient	Engine overhaul
	(2) Injection timing incorrect	Adjust
	(3) Injection pump timer out of function	Correct or replace
	(4) Nozzle injection pressure or spray angle incorrect	Adjust or replace
	(5) Feed pump defective	Corret or replace
	(6) Volume of intake air insufficient	Service air cleaner

Complaint	Cause	Correction
Engine overheating	(1) Cooling water level too low	Replenish and check for leakage
	(2) Radiator cap pressure valve spring weakened	Replace
	(3) Restrictions in radiator core	Correct or replace
	(4) Restrictions in oil cooler	Correct or replace
	(5) Fan belt loosened, worn or broken	Adjust or replace
	(6) Thermostat defective	Replace
	(7) Water pump defective	Replace
	(8) Injection timing incorrect	Adjust
	(9) Cylinder head gasket defective	Replace

2.4 Engine Noisy

It is important to check the engine components systematically to pinpoint the true cause of abnormal engine noise at it generally consists of various noises that orginate in rotating parts, sliding parts, etc.

Complaint	Cause	Correction
Crankshaft bearings	(1) Oil clearnace exceissive due to worn bearing or crankshaft	Replace or grind crankshaft
	(2) Crankshaft worn out-of-round	Replace or grind crankshaft
	(3) Restrictions in oil ports	Clean
	(4) Bearings seized up	Replace and grind crankshaft
Connecting-rods or connecting-rod bearings	(1) Connecting-rod bearings worn	Replace
	(2) Crankpins worn out-of-round	Replace or grind
	(3) Connecting-rod bent	Replace
	(4) Bearings seized up	Replace or grind
Pistons, piston pins and piston rings	(1) Piston clearance excessive due to worn piston and piston rings	Replace
	(2) Piston or piston pin worn	Replace
	(3) Piston seized up	Replace
	(4) Piston rings broken	Replace
Others	(1) Crankshaft thrust bearing worn	Replace
	(2) Camshaft end play excessive	Replace thrust bearings

Complaint	Cause	Correction
	(3) Idle gear end play excessive	Replace thrust collar
	(4) Timing gear backlash excessive	Replace
	(5) Valve clearances incorrect	Adjust
	(6) Valve seized up within valve guide	Replace
	(7) Valve spring(s) broken	Replace
	(8) Valve seat insert defective	Correct
	(9) Tappets and cams worn	Replace
	(10) Rocker arms and rocker armshaft bent	Replace

2.5 Fuel Consumption Excessive

Complaint	Cause	Correction
Trouble in fuel system	(1) Injection timing incorrect	Adjust
	(2) Volume of fuel injection excessive	Adjust
Others	(1) Clutch slipping	Correct or replace
	(2) Brake(s) dragging	Correct or replace
	(3) Tire under-inflated	Correct
	(4) Gear selection inadequate	Select geers according to load

2.6 Oil Consumption Excessive

Complaint	Cause	Correction
Oil leakage	(1) Clamping parts loosened	Tighten
	(2) Gaskets defective	Replace
	(3) Oil seals defective	Replace
Oil leaking past cylinder head	(1) Oil plug defective	Replace
	(2) Valve stems or valve guides worn excessively	Replace
	(3) Cylinder head gasket defective	Replace
Oil leaking into combustion chambers	(1) Clearance between piston and cylinder walls excessive	Replace
	(2) Piston rings and ring grooves worn excessively	Replace
	(3) Piston rings broken, worn or sticking	Replace
	(4) Piston rings gaps set incorrectly	Correct
	(5) Piston rings not correctly installed	Correct

Complaint	Cause	Correction
	(6) Oil return holes in oil control ring clogged	Replace
	(7) Air breather clogged	Clean

2.7 Exhaust Smoke Excessive

Complaint	Cause	Correction
Amount of white smoke exhausted excessive	(1) Injection timing too late	Adjust
	(2) Lack of compression pressure	Refer to "HARD STARTING"
	(3) Water in fuel	Replace fuel
	(4) Oil leaking into combustion chambers	Refer to "OIL CONSUMPTION EXCESSIVE"
	(5) Engine runs cool	Correct
	(6) Volume of fuel injection excessive	Adjust
	(7) Volume of fuel injection unequal	Adjust
Amount of dark smoke exhausted excessive	(1) Air cleaner element clogged	Clean or replace
	(2) Glow plug processing defective	Correct or replace
	(3) Intake hose sharply kinked or flattened	Correct or replace
	(4) Compression pressure insufficient	Refer to "ENGINE LACKS POWER"
	(5) Fuel injection timing too fast	Adjust
	(6) Volume of fuel injection excessive	Adjust or overhaul
	(7) Fuel spray patterns of nozzles poor	Adjust or replace
	(8) Valve clearance incorrect	Adjust
	(9) Use of wrong fuel	Replace

SECTION 3

ENGINE ASSEMBLY

INDEX

CONTENTS

1. DISASSEMBLY OF ENGINE

1.1 Oil level Gauge

- Take out the oil level gauge.

1.2 Engine Oil

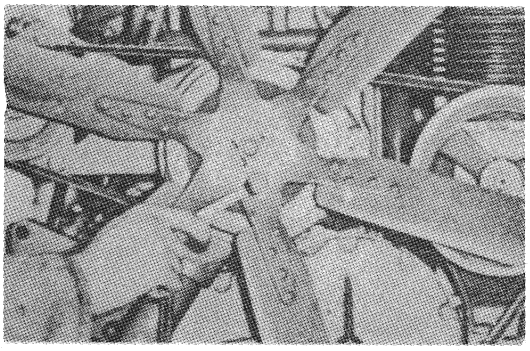
- Remove the drain plug from the oil pan and drain the engine oil
- Also drain the oil filter by removing the drain plug.

1.3 Cooling Water

- Remove the radiator filler cap and the drain plug from the engine block and drain the cooling water completely.

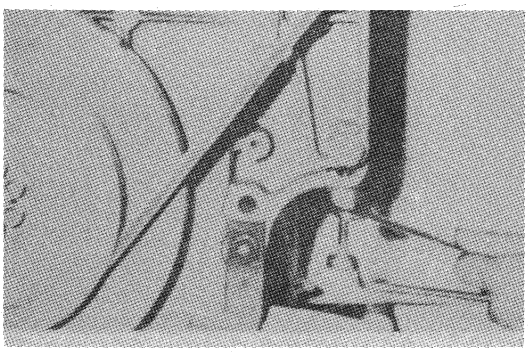
1.4 Cooling Fan

- Remove fan attaching bolts.
- Take off fan and flange.

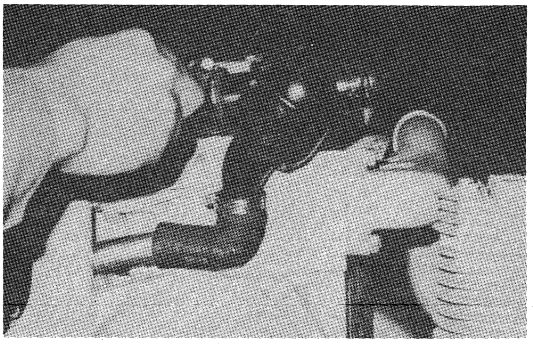


1.5 V-Belt

- Loosen the tension adjusting bolt attached on the air compressor bracket and take off the V-belt.

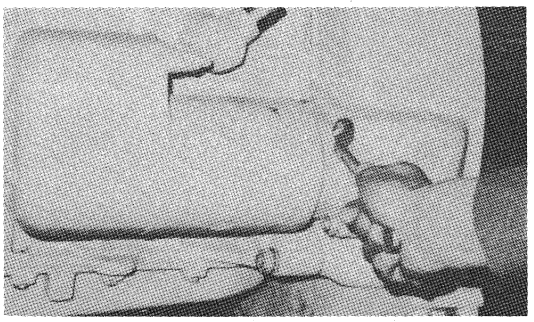


1.6 Thermostat



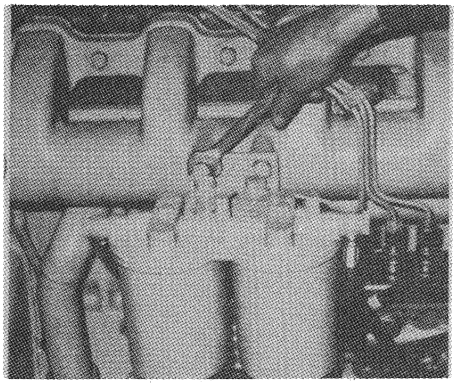
- Remove the thermostat.
- Remove the by-pass and rubber hoses.

1.7 Starter Motor



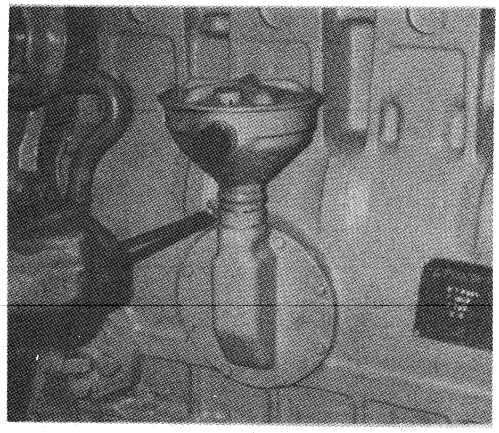
- Screw out the starter attaching nut and remove the starter.

1.8 Fuel Filter



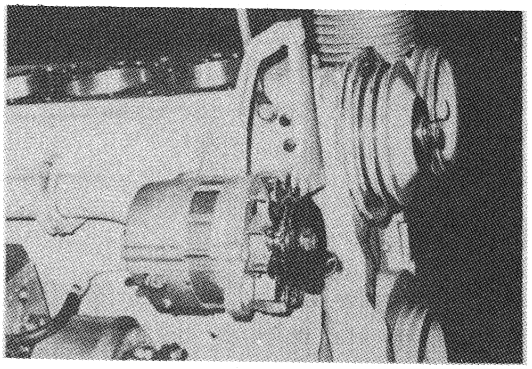
- Remove fuel hoses.
- Screw out the filter attaching bolts and take off the filter.

1.9 Breather Pipe



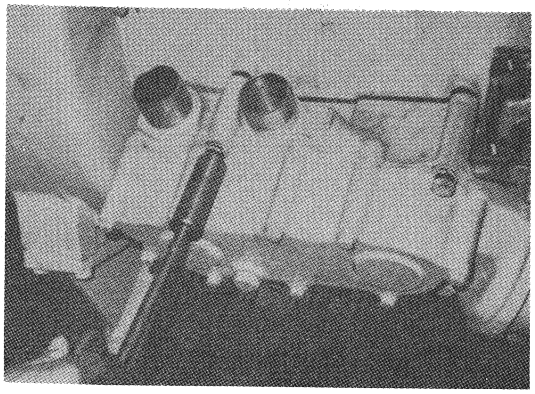
- Loosen the clamp screw of breather pipe.
- Remove the breather pipe.

1.10 Alternator

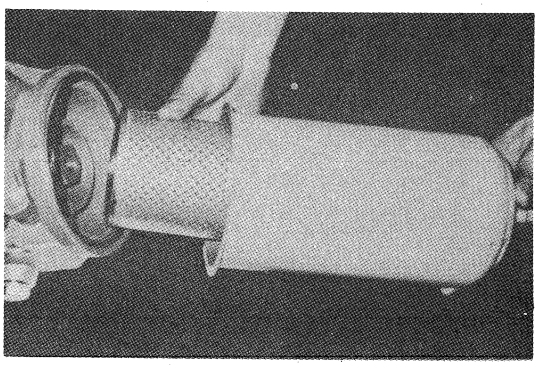


- Remove the alternator attaching bolts and take off alternator.

1.11 Oil Cooler, and Oil Filter

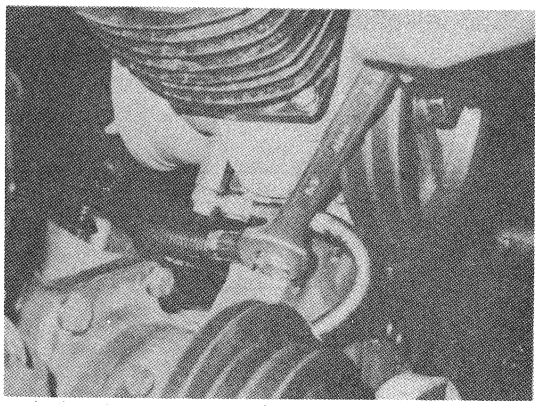


- Release the pipe clamp on the rubber joint from water pump to oil cooler and from oil cooler to thermostat.
- Screw off oil cooler attaching nuts and take off the oil cooler.



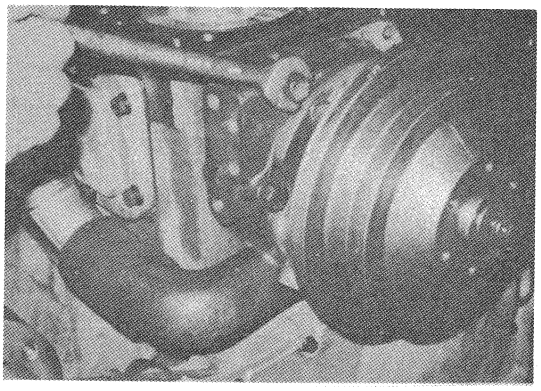
- Remove the oil filter from the oil cooler assembly.

1.12 Air Compressor and Idle Pulley



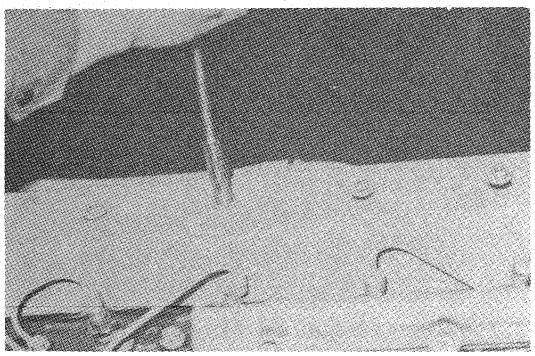
- Remove the oil pipes between cylinder block and air compressor.
- Unscrew the air compressor attaching bolts and remove the air compressor assembly.
- Unscrew the air compressor bracket attaching bolts and remove the bracket.

1.13 Water Pump



- Unscrew the water pump attaching bolts and remove the pump.

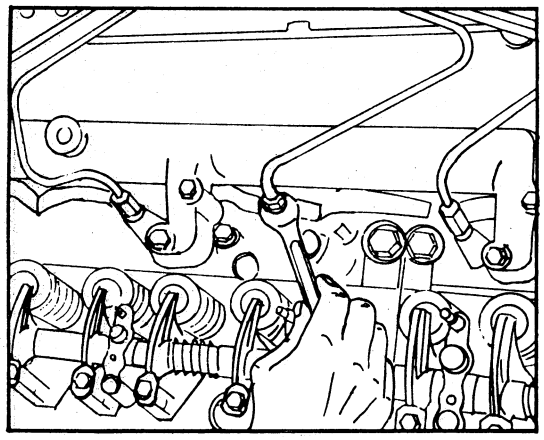
1.14 Cylinder Head Cover



- Unscrew the cylinder head cover(s) bolts and remove the cover(s).

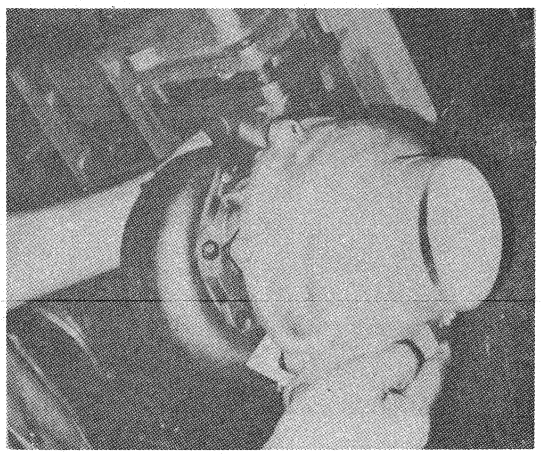
1.15 Injection Nozzle

- Unscrew the fuel pressure pipes at nozzle holders and remove the pipes.



- Remove the injection nozzle assembly using special tool.
- Remove the seal from nozzle holder hole of cylinder head and discard it.

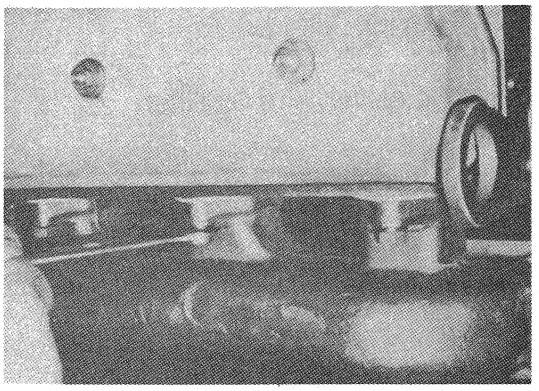
1.16 Turbo Charger



- Remove the inlet and outlet oil pipes between cylinder block and turbo charger.
- Loosen the clamp screw of rubber hose connected to intake manifold.
- Unscrew the turbo charger attaching bolts and remove the turbo charger from the exhaust manifold.

1.17 Exhaust Manifold

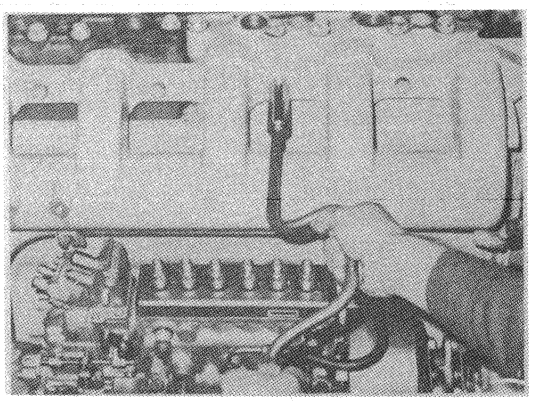
- Unscrew the exhaust manifold attaching bolts and remove the exhaust manifold from the cylinder head.



- Remove the exhaust manifold gasket and discard it.

1.18 Intake Manifold

- Unscrew the intake manifold attaching bolts and remove the intake manifold from the cylinder head.

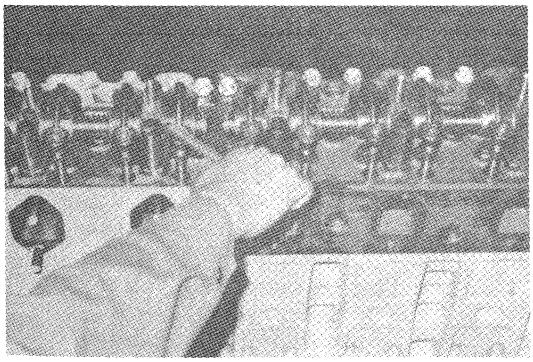


- Remove the intake manifold gasket and discard it.

1.19 Cooling Water Pipe

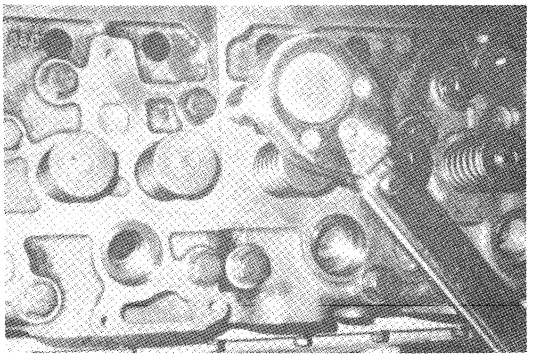
- Unscrew the cooling water pipe attaching bolts and remove from the cylinder head.
- Remove the cooling water pipe gasket and clean the surface using a suitable scraper.

1.20 Rocker Arm



- Remove attaching bolts for rocker arm brackets and take out locker arm assembly.
- Take out push rods upwards.

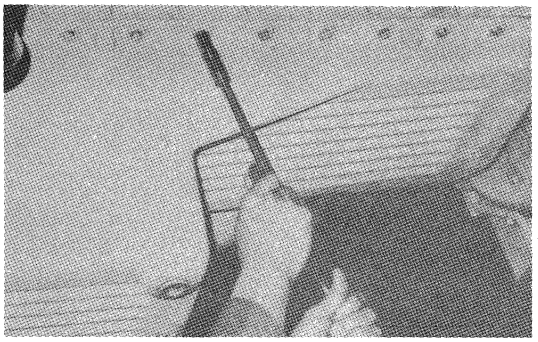
1.21 Cylinder Head



- Remove the cylinder head bolts by loosening them in sequence in two steps.

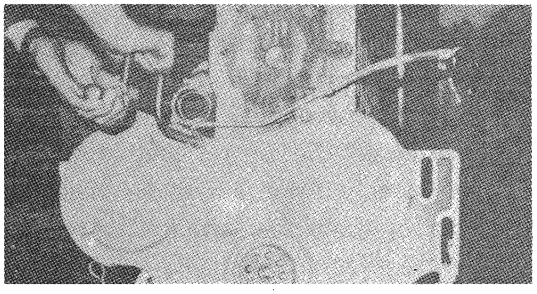
  Note : *Always loosen bolts in progression and avoid loosening bolts in localized area, or cylinder head distortion may result.*
- Take off cylinder head(s) and gasket(s).

1.22 Oil Pan



- Unscrew the oil pan attaching bolts and remove the oil pan.
- Remove the oil pan gasket and discard it.

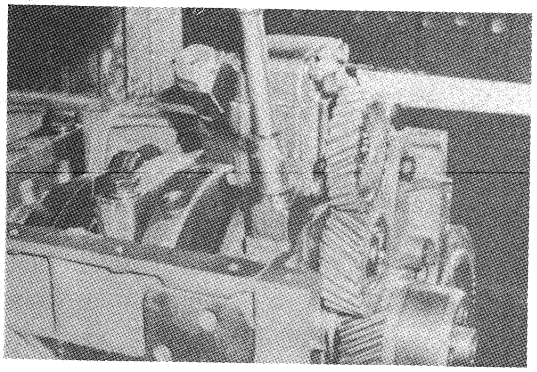
1.23 Timing Gear Case Cover



- Unscrew the timing gear case cover attaching bolts, and remove the timing gear case cover.

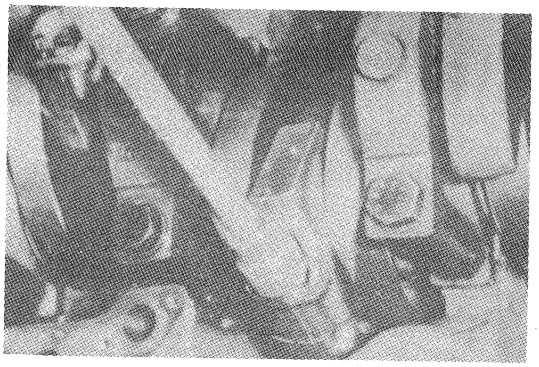
1.24 Oil Pump

- Unscrew oil suction pipe bracket fixing bolts.
- Unscrew the bolts fixing oil suction pipe and remove the oil suction pipe.



- Unscrew the bolts mounting the oil pump, then take off the oil pump assembly.

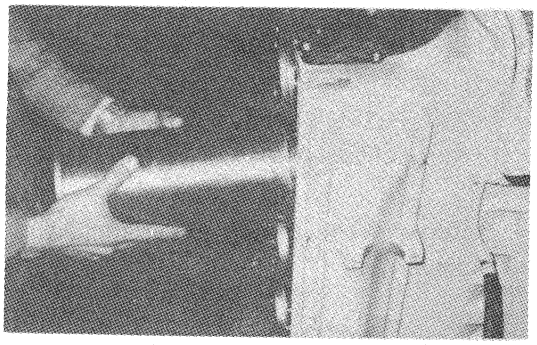
1.25 Piston



- Unscrew the bolts clamping the connecting-rod bearing cap in reverse sequence of installing order.
- Take off connecting-rod bearing caps with bearing shells.
- Remove combustion residue from upper edge of cylinder liner to facilitate smooth withdrawed of the piston.
- Remove the piston and connecting-rod assembly toward cylinder head side by pushing on the connecting-rod big-end with a hammer handle.
- Remove the bearing from the connecting rod and bearing cap, then apply a cylinder number mark to the rear face of the bearings.

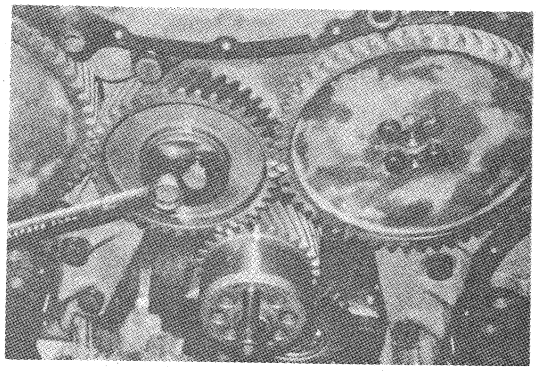
Note : *Remove connecting rod in parallel with cylinder bore to prevent scratching liner wall in contact with connecting rod.*

1.26 Cylinder Liner



- Pull out the cylinder liner using the cylinder liner extractor or by hand carefully so as not to damage the cylinder bore.
- Number cylinder liners-according to installed position.

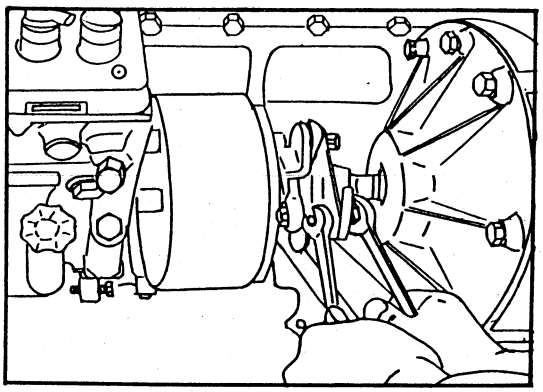
1.27 Gear and Idle Gear Pin



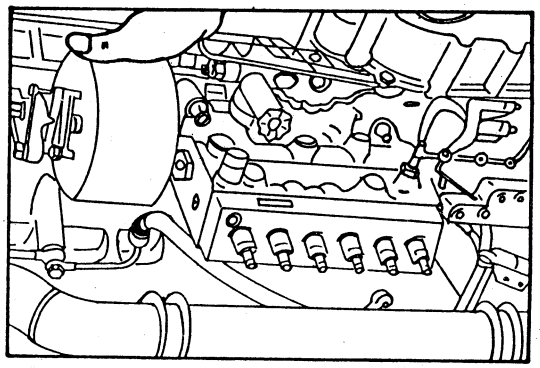
- Unscrew two bolts fixing the idle gear, then remove the idle gear with thrust washer.
- Unscrew the bolts mounting the camshaft gear, then remove the camshaft.
- Take off the idle gear pin.

1.28 Fuel Injection Pump

- Remove the joint and nut on the injection pump oil pipe, then remove the clip and oil pipe.

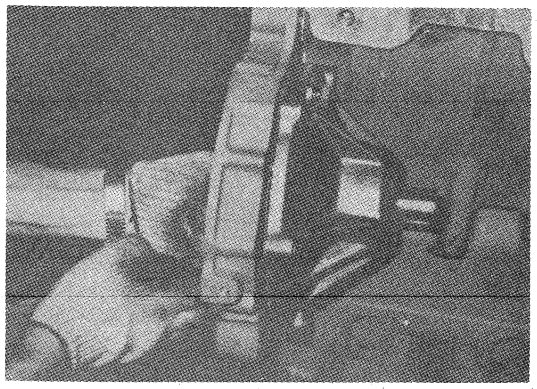


- Unscrew the coupling flange attaching bolts and nuts, using two wrenches.



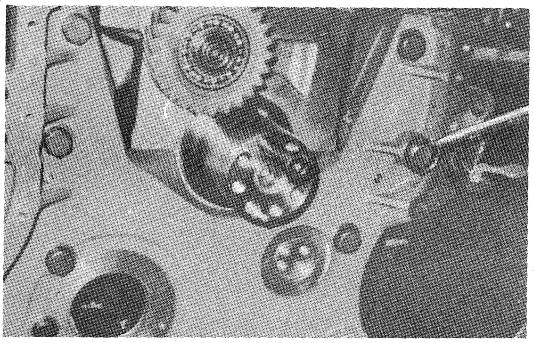
- Remove the bolts mounting the injection pump, then remove the injection pump upwards.
- Unscrew the injection pump bracket attaching bolts, then remove the bracket, tapping the upper and lower edge of bracket with a plastic hammer.

1.29 Injection Pump Drive Gear.



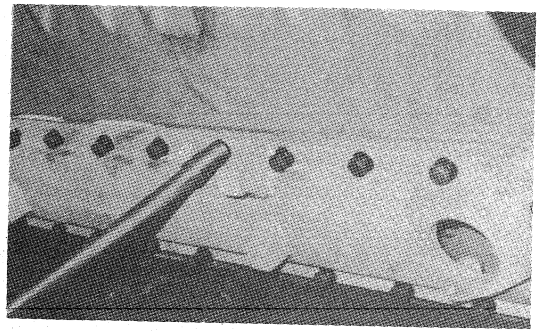
- Unscrew the bolts fixing the injection pump drive gear housing and remove the drive gear assmbly.

1.30 Timing Gear Case



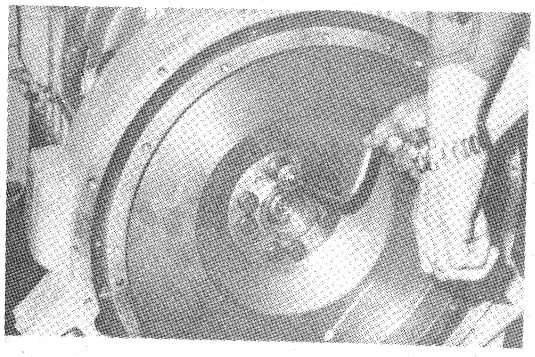
- Unscrew the bolts fixing the timing gear case.
- Remove the timing gear case, tapping the rear side of case with a plastic hammer.

1.31 Cooling Water Chamber Cover



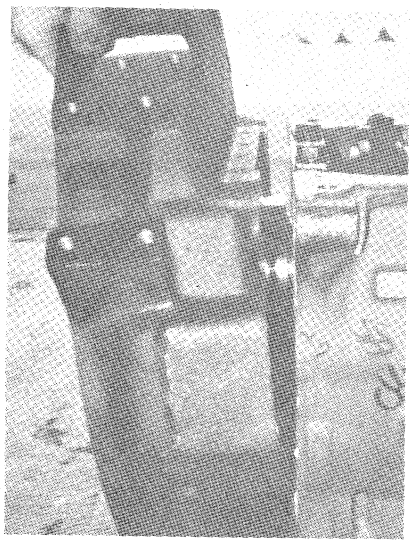
- Unscrew the chamber cover attaching bolts and remove the chamber cover.
- Remove gasket residue on the both side of cylinder block and chamber cover using a scraper.

1.32 Flywheel



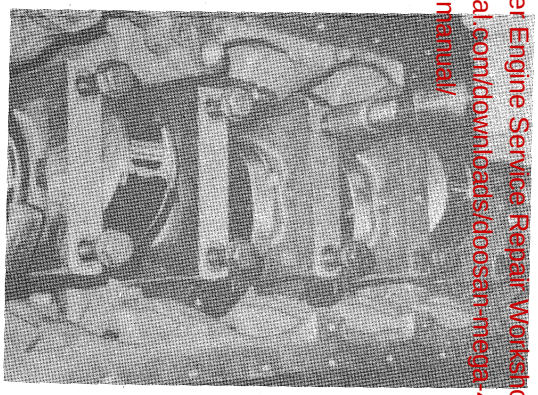
- Remove the bolts fixing the flywheel by loosening them in diagonal sequence.
- Remove the flywheel.

1.33 Flywheel Housing



- Remove the bolts attaching the flywheel housing, then remove the flywheel housing by tapping lightly with a copper or plastic hammer.
- Remove the oil seal retainer on the flywheel housing, then remove the oil seal.

1.34 Bearing Cap



- Remove the crankshaft bearing cap bolts by loosening them in sequence commencing with the outer ones, then remove the bearing caps together with the bearing.
- Number bearing caps.

1.35 Crankshaft

- Tighten bolts temporarily on the both sides of crankshaft.
- Carefully lift out crankshaft with a rope.
- Take bearing shells out cylinder block and mark them.

1.36 Camshaft & Tappet

- Remove camshaft by carefully sliding it out the front of the engine. Do not force shaft as damage can occur to camshaft bearings.