FOREWORD

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.

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ENGINE (D2366)

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ENGINE
MAINTENANCE(D2366)

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

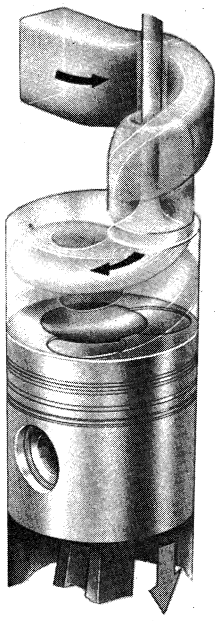
The engine operates according to the Toroidal combustion system developed by Daewoo Heavy lndustrial Co. of Korea and AVL Co. of Austria.

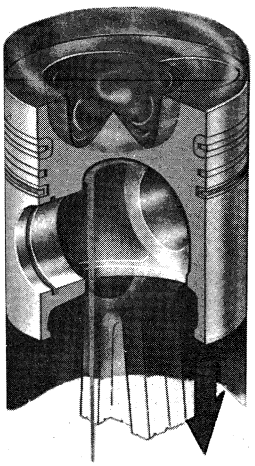
The main design features of this system are the combustion chamber arranged in the center of the piston and the swirling passage in the cylinder head.

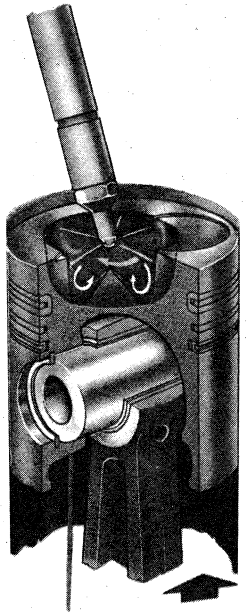
Due to the swirling passage, the air entering the cylinder through the helical port designed specially during intake stroke is imparted a strong rotary motion in the combustion chamber and the complicated turbulence motion created by the swirl produced during compression stroke and strong squish flow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







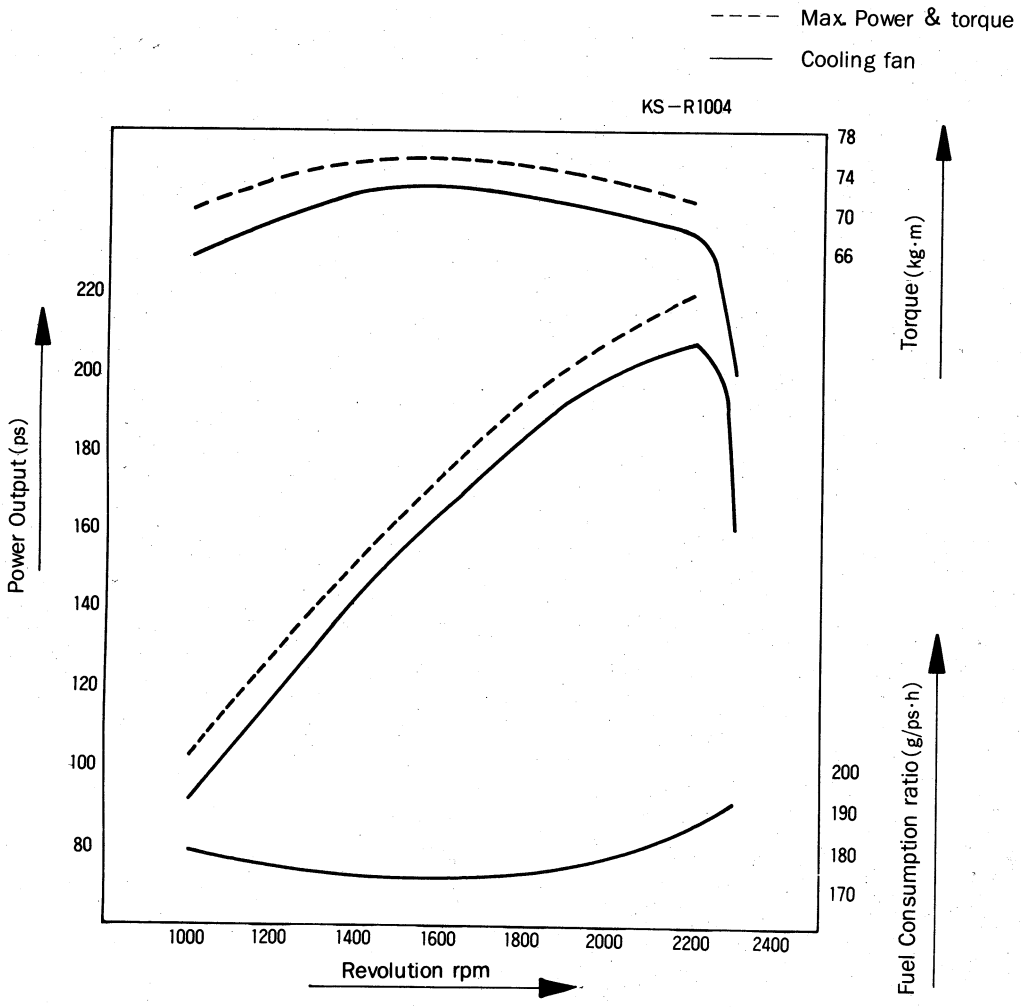
2.2 Specification

Item		Specification		
Model		D2366		
Engine type		Water cooled, 4 cycle, vertical in-line type		
Combustion chamber type		Toroidal combustion		
Fuel injection type		Direct injection		
Cylinder bore×stroke(mm)−No. of cylinder		123×155−6		
Total displacement		11,051cc		
Compression ratio		17.5 : 1		
Firing order		1−5−3−6−2−4		
Rotation		Counter clockwise viewed from flywheel		
Valve mechanism		Overhead valve		
Valve clearance		Intake 0.3㎜, Exhaust 0.3㎜ at cold		
Timing			Open at	Close at
		Intake valve	BTDC 180°	ABDC134°
		Exhaust valve	BBDC 46°	ATDC 14°
PERFORMANCE	DIN6270B RATED Output Max. torque	143kw(194ps)/2,000 rpm 725N-m(74kg · m)/1,400 rpm		
	No load max. engine speed	Below 2,200 rpm		
	No load min. engine speed	800±25 rpm		
	Compression pressure	Above 28kg/㎠ at 200 rpm		
	Weight (Dry)	Approx. 880kg		
	Dimension (L×W×H)	1,283㎜×846㎜×1,071㎜		
	Fuel consumption	230g/ps.h at 2,000 rpm (DIN 6270B)		
FUEL SYSTEM	Injection pump	Bosch in-line "P" type		
	Governor	RSV type (All speed control)		
	Fuel feed pump	Mechanical type		
	Injection timing control	Automatic timer		
	Injection nozzle	Multi hole type		
	Injection pressure	214kg/㎠		
	Fuel filter	Full flow double stage filter −1st : Fuel element −2nd : paper element		

Item		Specification
LUBRICATING SYSTEM	Lubricating method	Full forced pressure feed type
	Oil pump	Gear type by crank shaft driven
	Oil filter	Full flow, paper element type
	Oil pan capacity	High level ; 21 ℓ, Low level ; 17 ℓ
	Angularity limit	Front down 35deg. front up 35deg. side to side 35deg.
	Oil cooler	Water cooled, integral type
	Lubricating oil (Recommend)	API SERVICE CLASSIFICATION CC or CD
COOLING SYSTEM	Cooling method	Fresh water forced circulation
	Fan speed to E/G speed	1.22 : 1
	Cooling water capacity	19 ℓ(Engine only)
	Water pump	Centrifugal type by belt driven
	Capacity of water pump	215 ℓ/min
	Thermostat	Wax-pellet type Opening temp. 82 ℃ Full opening temp. 95℃
	Cooling fan	Suction type, steel ϕ625mm, 6 blades
ELECTRICAL SYSTEM	Alternator	24V×45A
	Voltage regulator	Built-in type IC Regulator
	Starter	24V×6.6 kw(Magnet type)
	Starting aid	Air heater
	Battery and its capacity	12V, 200AH×2EA

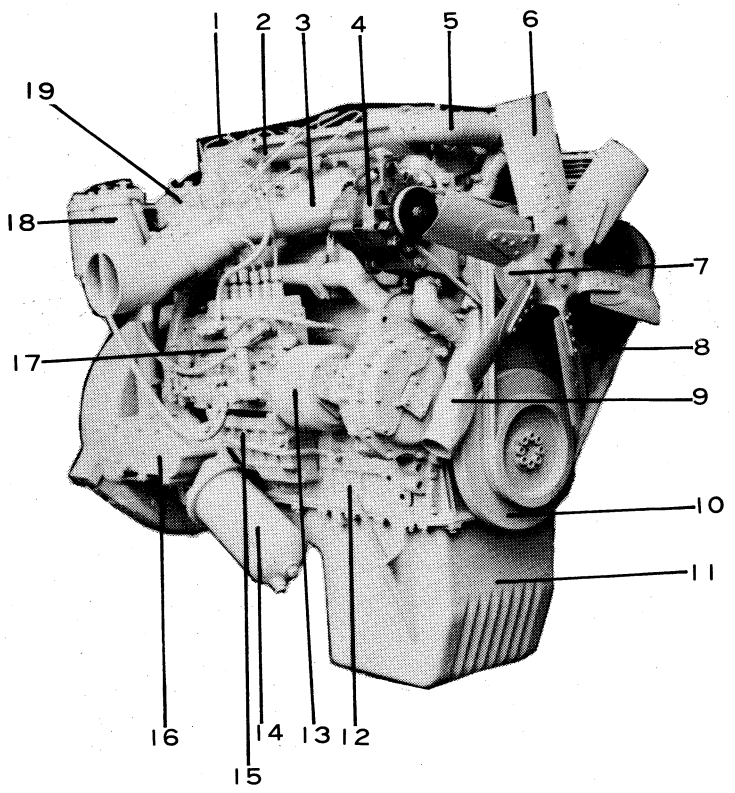
2.3 Engine Performance Curve

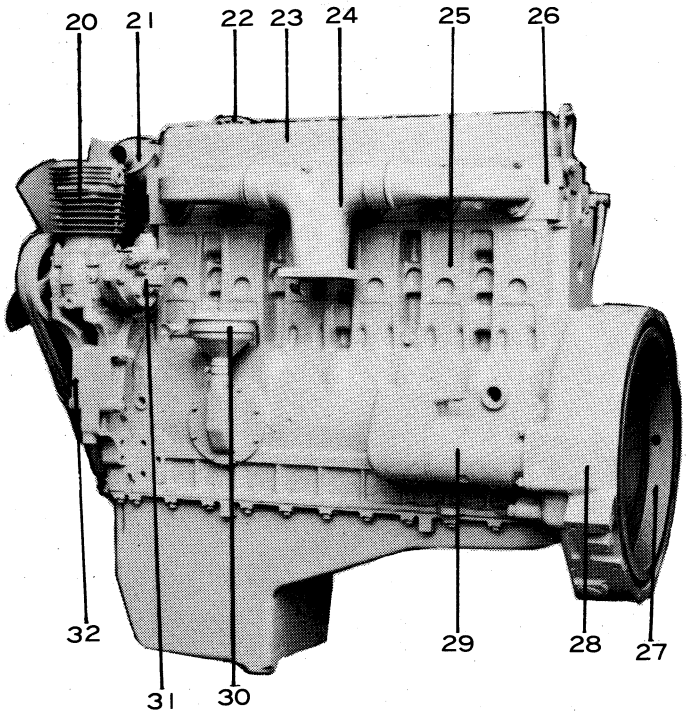
Test	condition
Atmosphere	760mmHg
Warming up	Sufficient
Cooling fan	Blower type
Generator	Installed
Air cleaner	Installed
Muffler	Not installed



Performance standard	KS-R1004
Output power (Max. Rated)	208PS/2200rpm
Max. torque	72.5k·m̃/1500rpm
Consumption ratio(Min. Rated)	185g/ps·h

2.4 D2366 ENGINE





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

SECTION 2

PREVENTIVE MAINTENANCE

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1.2 INSPECTION AND MAINTENANCE PROCEDURE	8
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1. SERVICING OF ENGINE

1.1 General

Regular inspection and maintenance are 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

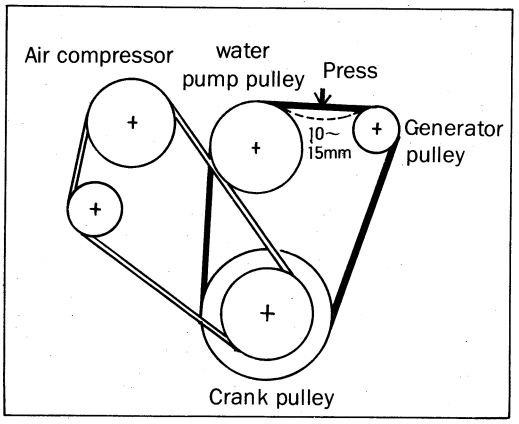
- Flush the cooling system using rain water or city water with cleanser.
- With begin of the cold weather season the coolant must be checked with a calibrated hydrometer for sufficient freeze protection and if necessary, antifreeze must be added as described below.

Anti-freeze solution(5)	Freezing Point(℃)
–	–
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.

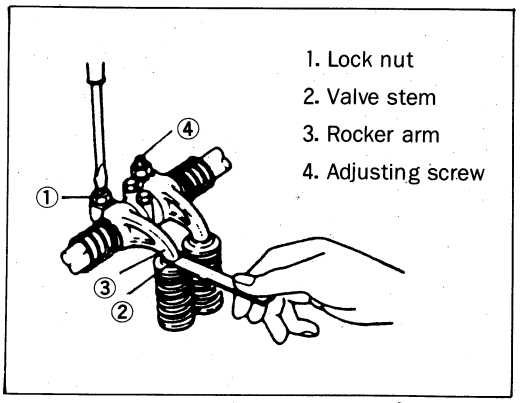
1.2.6 Air Cleaner

- 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 instructions.

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

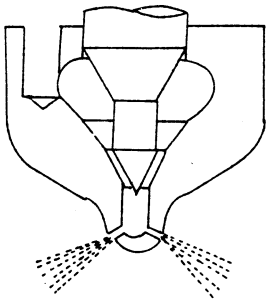
- Remove the entire nozzle holders after engine is warmed up.
- Mount the compression gauge adapter in position of nozzle holder and install the compression gauge.
- Measure the compression pressure in the cylinders with operating the starter motor.

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

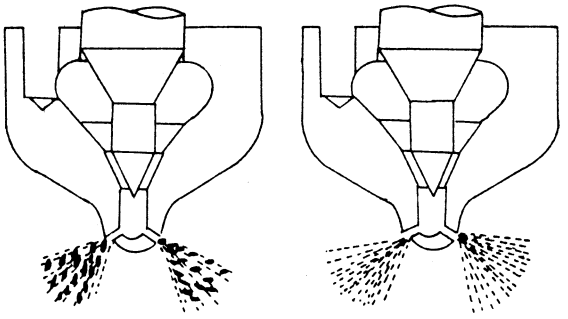
Condition : coolant temperature, 20°C
Engine rpm: 200r.p.m.

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.



normal

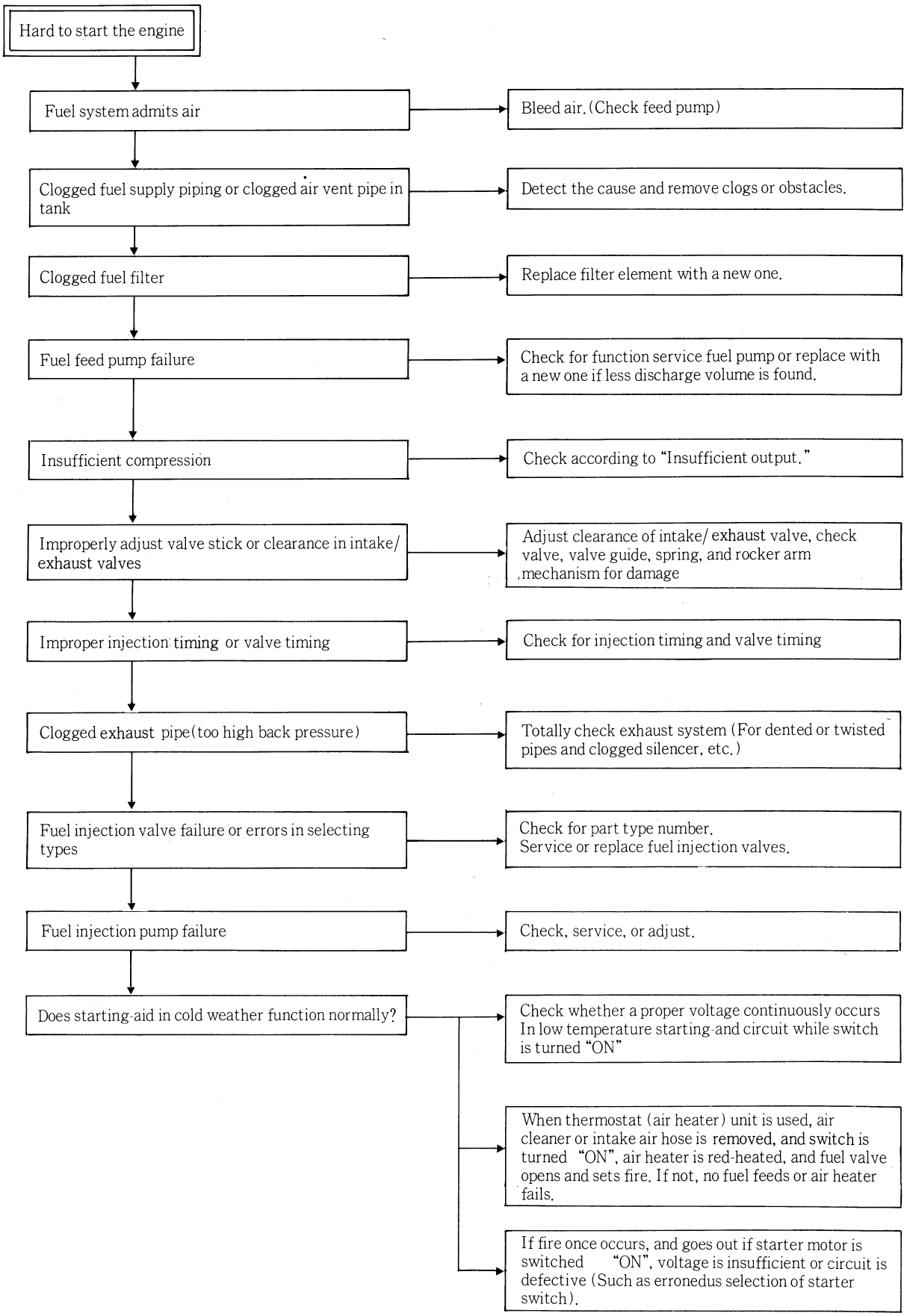


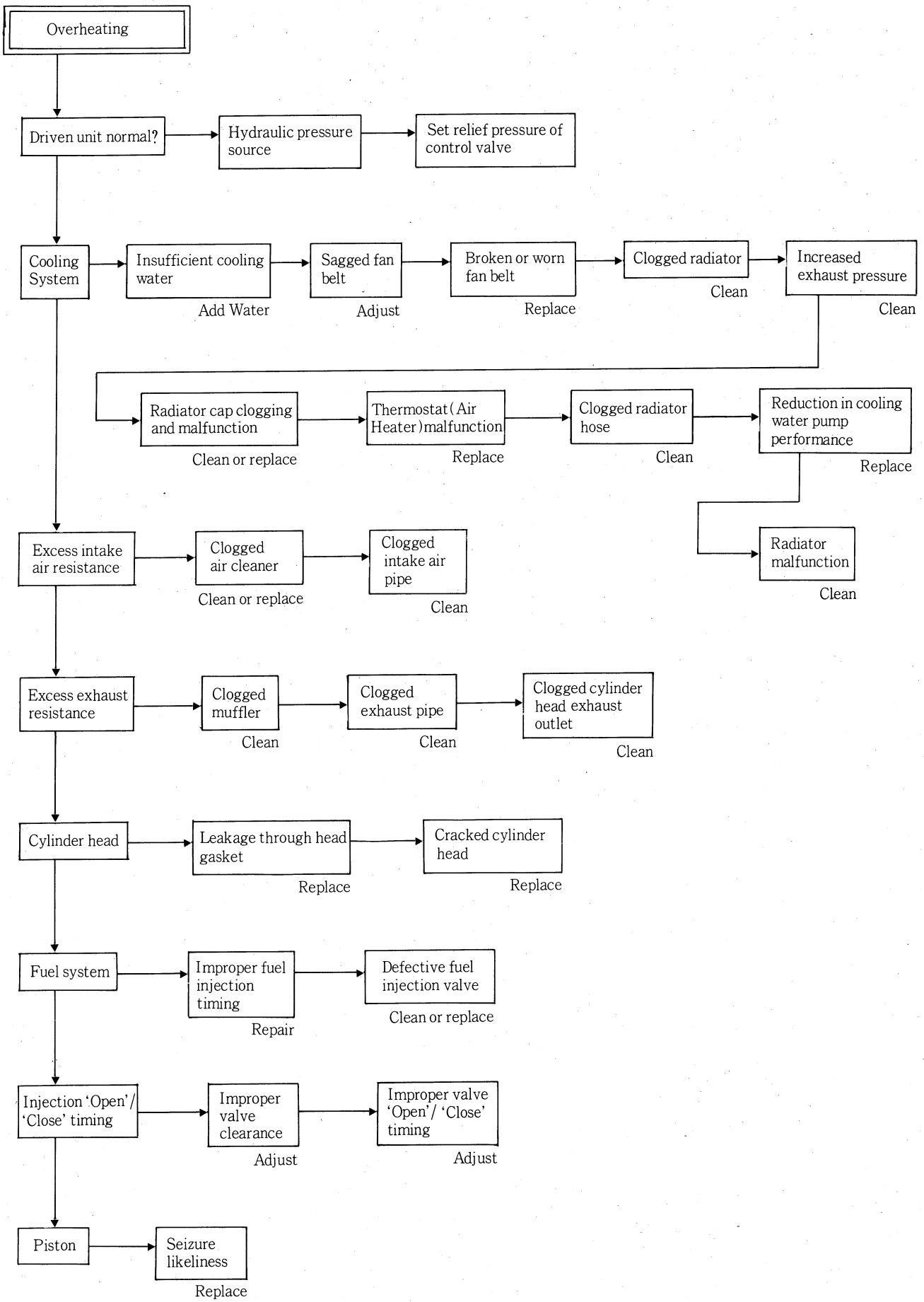
abnormal abnormal

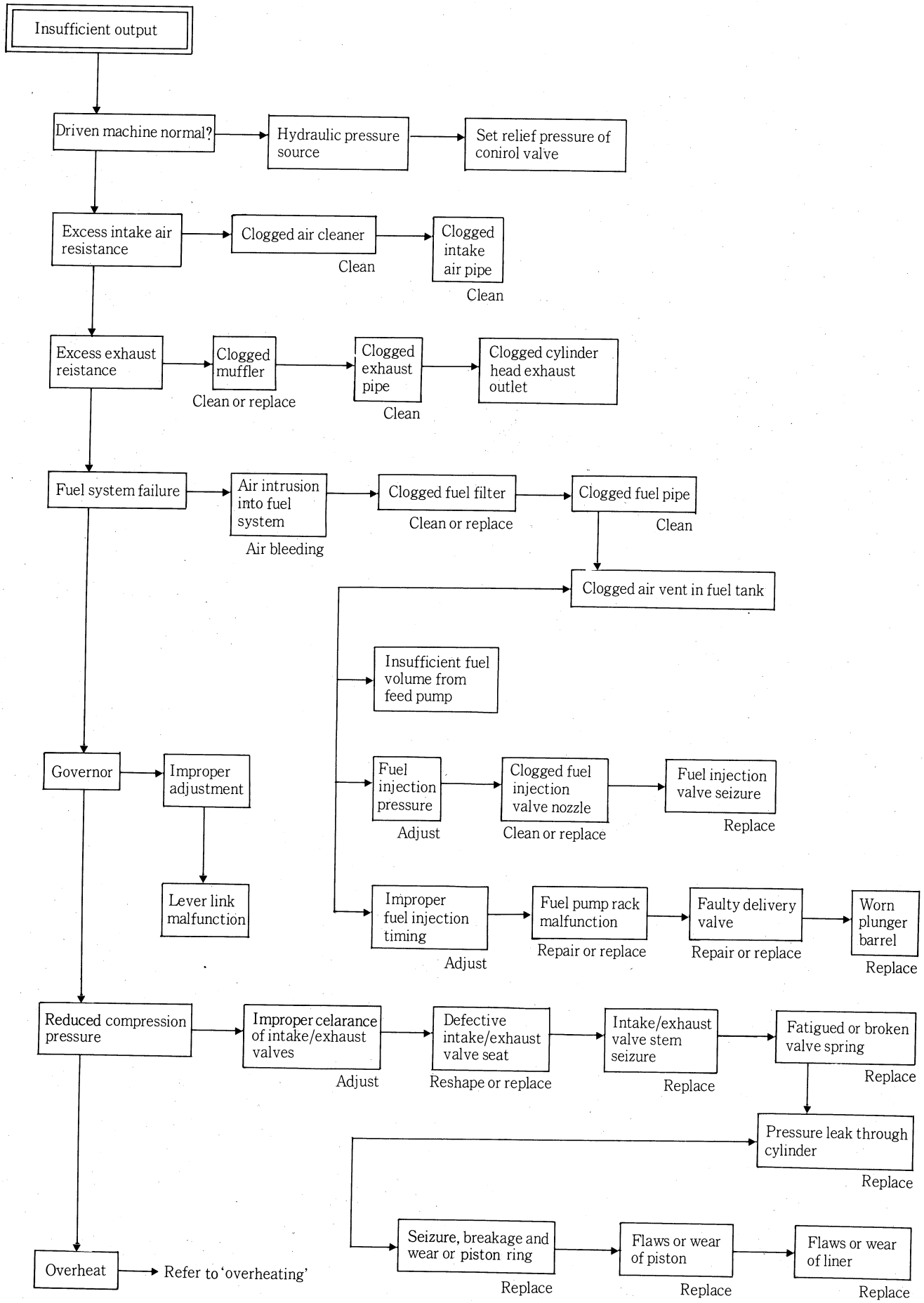
1.2.10 Air Bleeding

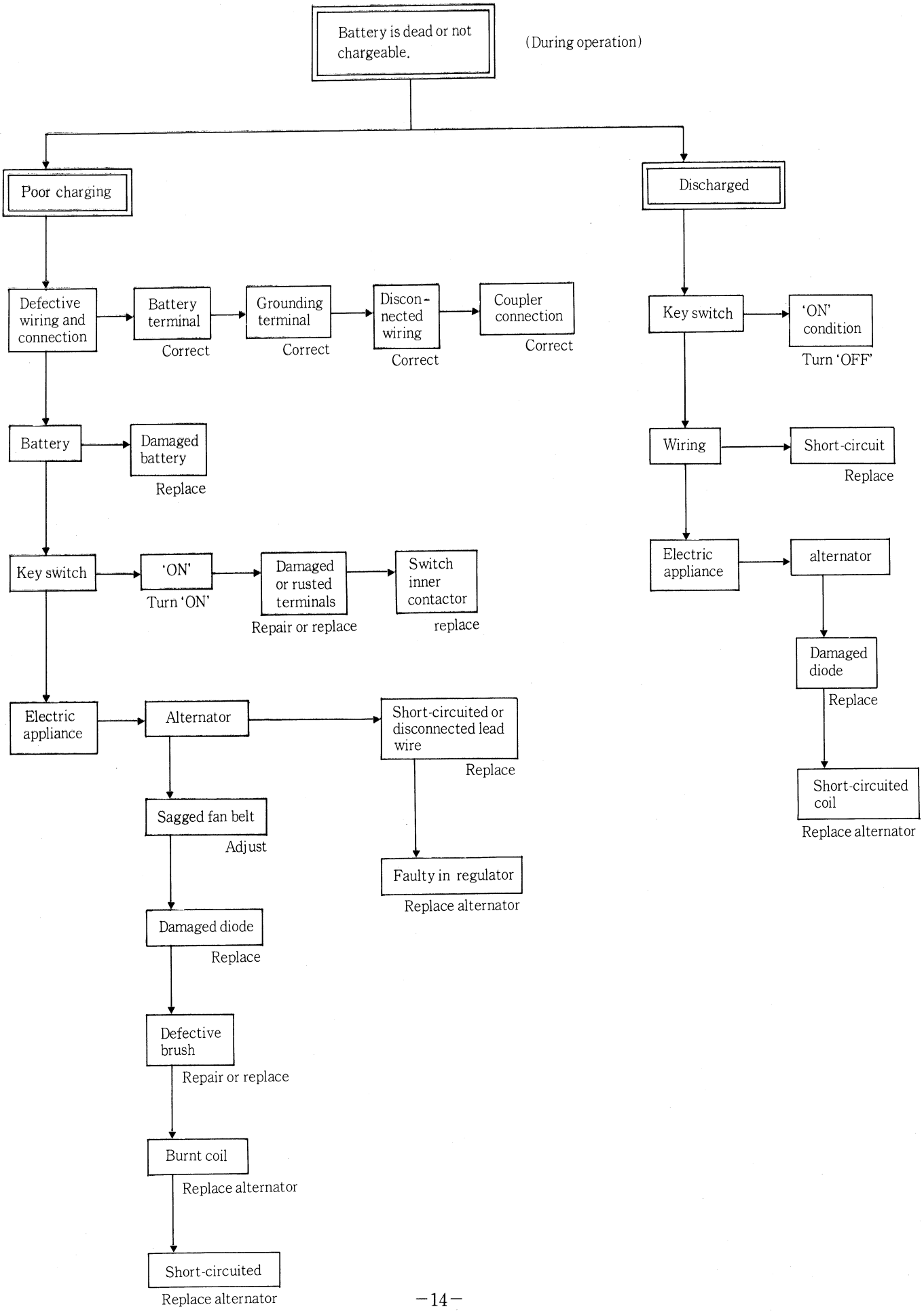
If air is in the fuel system or after the fuel system service has been done, bleeding of the fuel system should be performed. The bleeding operations are as follows.

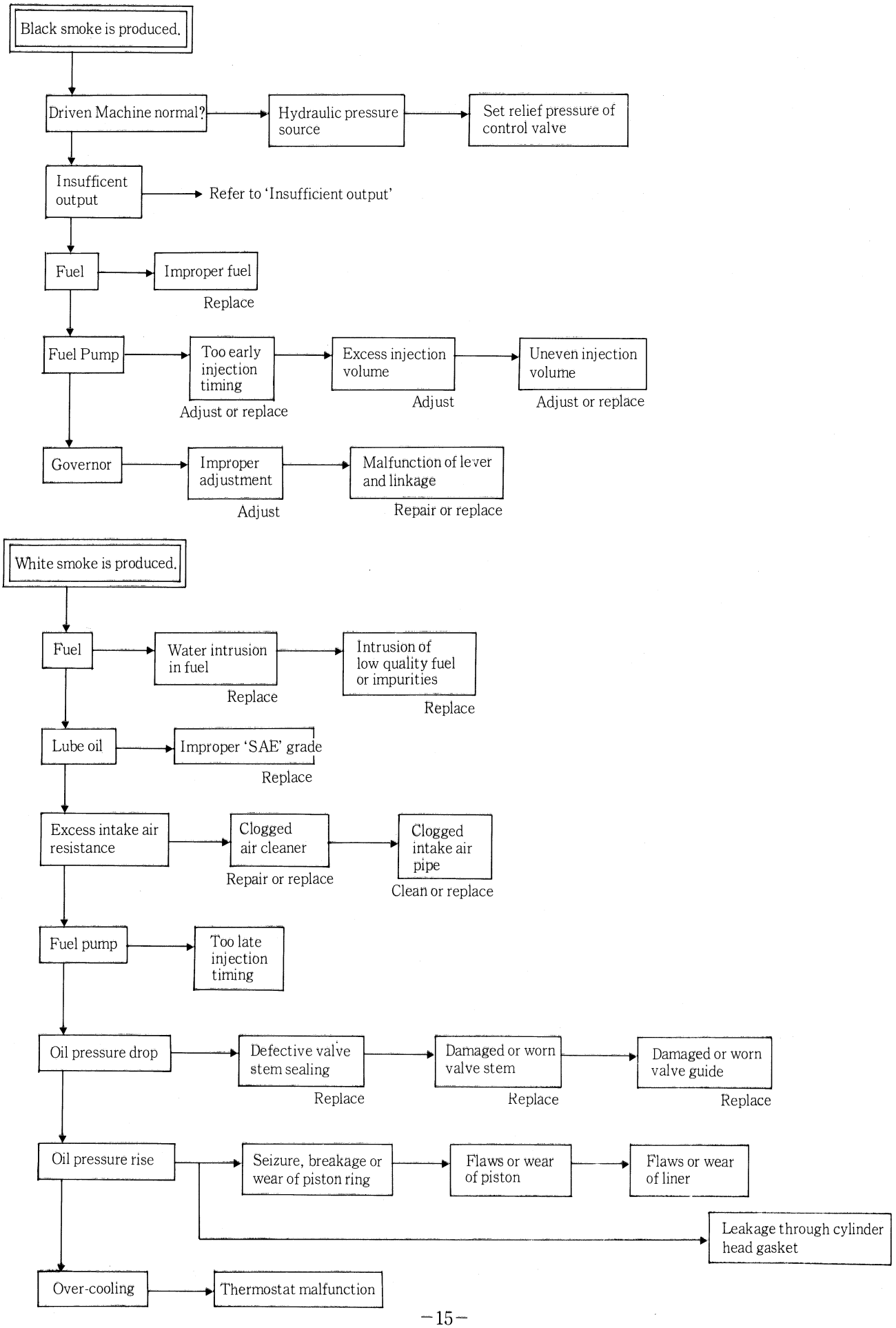
- Turn loose the air bleeder screws on the fuel filters, and manually operate the fuel priming pump on the fuel feed pump to bleed the air through the bleeder screw.
- After checking to make sure that the fuel system is completely bled, securely tighten the air bleeder screw of the first fuel filter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

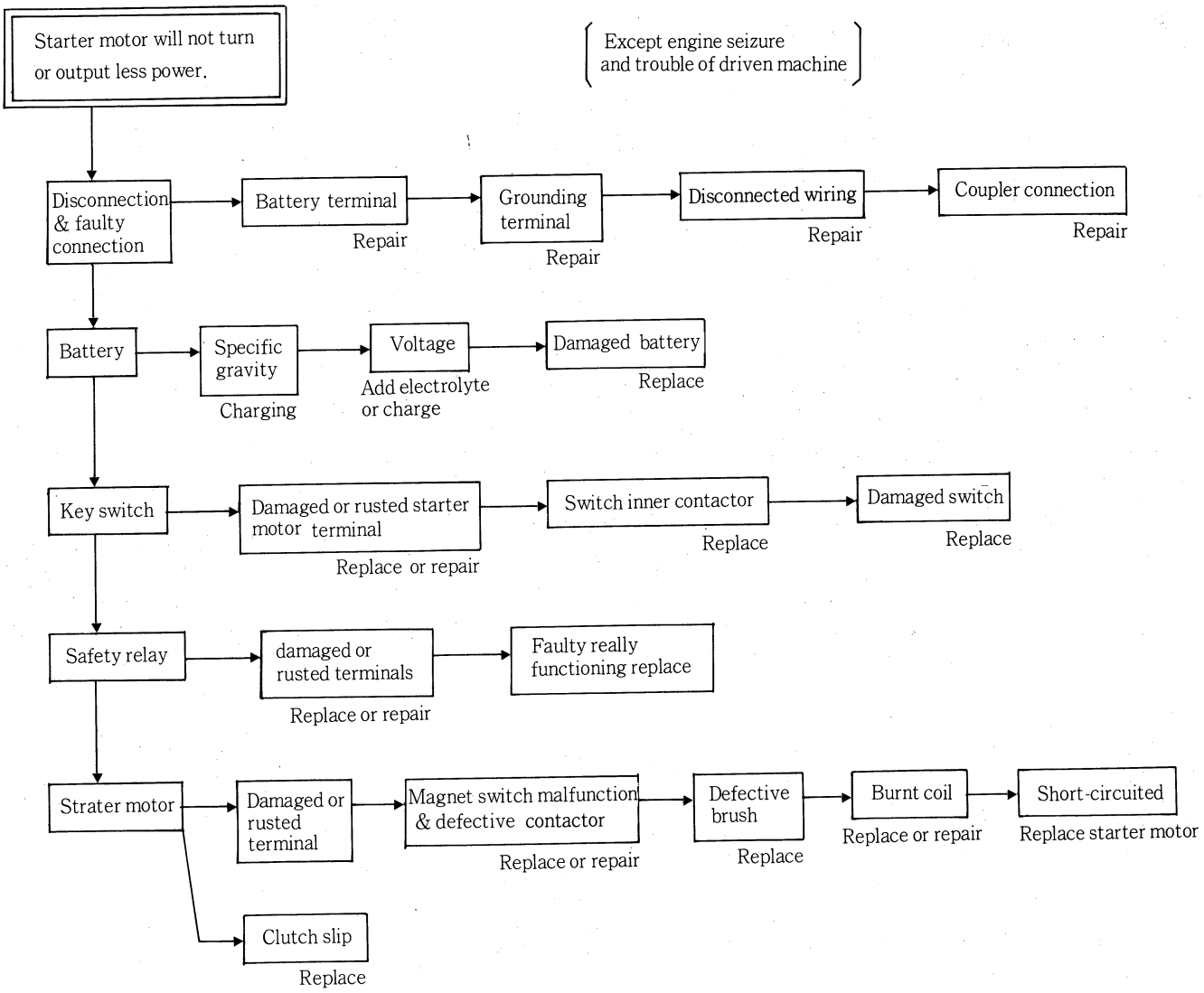

Hard to start the engine
Fuel system admits air
Bleed air. (Check feed pump)
Clogged fuel supply piping or clogged air vent pipe in tank
Detect the cause and remove clogs or obstacles.
Clogged fuel filter
Replace filter element with a new one.
Fuel feed pump failure
Check for function service fuel pump or replace with a new one if less discharge volume is found.
Insufficient compression
Check according to "Insufficient output."
Improperly adjust valve stick or clearance in intake/ exhaust valves
Adjust clearance of intake/ exhaust valve, check valve, valve guide, spring, and rocker arm ,mechanism for damage
Improper injection timing or valve timing
Check for injection timing and valve timing
Clogged exhaust pipe(too high back pressure)
Totally check exhaust system (For dented or twisted pipes and clogged silencer, etc.)
Fuel injection valve failure or errors in selecting types
Check for part type number.
Service or replace fuel injection valves.
Fuel injection pump failure
Check, service, or adjust.
Does starting-aid in cold weather function normally?
Check whether a proper voltage continuously occurs In low temperature starting-and circuit while switch is turned "ON"
When thermostat (air heater) unit is used, air cleaner or intake air hose is removed, and switch is turned "ON", air heater is red-heated, and fuel valve opens and sets fire. If not, no fuel feeds or air heater fails.
If fire once occurs, and goes out if starter motor is switched "ON", voltage is insufficient or circuit is defective (Such as erronedus selection of starter switch).


Overheating
Driven unit normal?
Hydraulic pressure source
Set relief pressure of control valve
Cooling System
Insufficient cooling water
Add Water
Sagged fan belt
Adjust
Broken or worn fan belt
Replace
Clogged radiator
Clean
Increased exhaust pressure
Clean
Radiator cap clogging and malfunction
Clean or replace
Thermostat (Air Heater) malfunction
Replace
Clogged radiator hose
Clean
Reduction in cooling water pump performance
Replace
Radiator malfunction
Clean
Excess intake air resistance
Clogged air cleaner
Clean or replace
Clogged intake air pipe
Clean
Excess exhaust resistance
Clogged muffler
Clean
Clogged exhaust pipe
Clean
Clogged cylinder head exhaust outlet
Clean
Cylinder head
Leakage through head gasket
Replace
Cracked cylinder head
Replace
Fuel system
Improper fuel injection timing
Repair
Defective fuel injection valve
Clean or replace
Injection 'Open'/ 'Close' timing
Improper valve clearance
Adjust
Improper valve 'Open'/ 'Close' timing
Adjust
Piston
Seizure likeliness
Replace

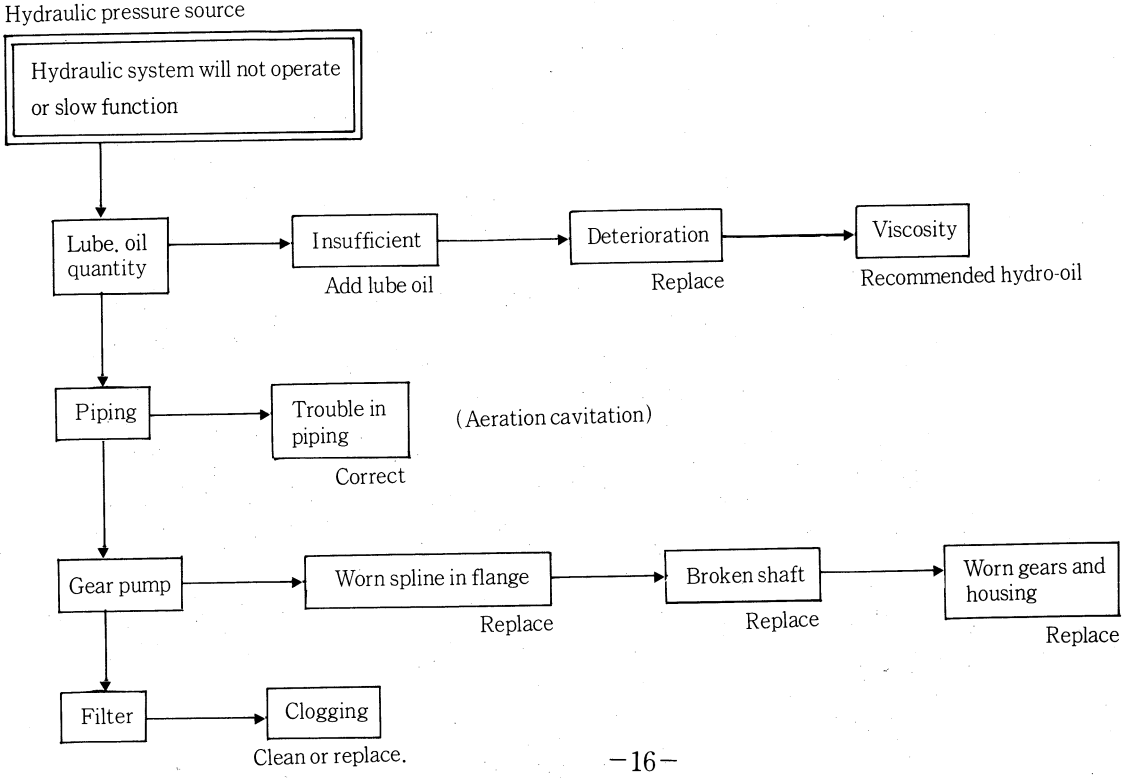

Insufficient output
Driven machine normal?
Hydraulic pressure source
Set relief pressure of conirol valve
Excess intake air resistance
Clogged air cleaner
Clean
Clogged intake air pipe
Clean
Excess exhaust reistance
Clogged muffler
Clean or replace
Clogged exhaust pipe
Clean
Clogged cylinder head exhaust outlet
Fuel system failure
Air intrusion into fuel system
Air bleeding
Clogged fuel filter
Clean or replace
Clogged fuel pipe
Clean
Clogged air vent in fuel tank
Insufficient fuel volume from feed pump
Governor
Improper adjustment
Lever link malfunction
Fuel injection pressure
Adjust
Clogged fuel injection valve nozzle
Clean or replace
Fuel injection valve seizure
Replace
Improper fuel injection timing
Adjust
Fuel pump rack malfunction
Repair or replace
Faulty delivery valve
Repair or replace
Worn plunger barrel
Replace
Reduced compression pressure
Improper celarance of intake/exhaust valves
Adjust
Defective intake/exhaust valve seat
Reshape or replace
Intake/exhaust valve stem seizure
Replace
Fatigued or broken valve spring
Replace
Pressure leak through cylinder
Replace
Seizure, breakage and wear or piston ring
Replace
Flaws or wear of piston
Replace
Flaws or wear of liner
Replace
Overheat
Refer to 'overheating'


Battery is dead or not chargeable.
(During operation)
Poor charging
Discharged
Defective wiring and connection
Battery terminal
Correct
Grounding terminal
Correct
Discon-nected wiring
Correct
Coupler connection
Correct
Key switch
'ON' condition
Turn 'OFF'
Battery
Damaged battery
Replace
Wiring
Short-circuit
Replace
Key switch
'ON'
Turn 'ON'
Damaged or rusted terminals
Repair or replace
Switch inner contactor
replace
Electric appliance
alternator
Damaged diode
Replace
Electric appliance
Alternator
Short-circuited or disconnected lead wire
Replace
Short-circuited coil
Replace alternator
Sagged fan belt
Adjust
Faulty in regulator
Replace alternator
Damaged diode
Replace
Defective brush
Repair or replace
Burnt coil
Replace alternator
Short-circuited
Replace alternator


Black smoke is produced.
Driven Machine normal?
Hydraulic pressure source
Set relief pressure of control valve
Insufficent output
Refer to 'Insufficient output'
Fuel
Improper fuel
Replace
Fuel Pump
Too early injection timing
Adjust or replace
Excess injection volume
Adjust
Uneven injection volume
Adjust or replace
Governor
Improper adjustment
Adjust
Malfunction of lever and linkage
Repair or replace
White smoke is produced.
Fuel
Water intrusion in fuel
Replace
Intrusion of low quality fuel or impurities
Replace
Lube oil
Improper 'SAE' grade
Replace
Excess intake air resistance
Clogged air cleaner
Repair or replace
Clogged intake air pipe
Clean or replace
Fuel pump
Too late injection timing
Oil pressure drop
Defective valve stem sealing
Replace
Damaged or worn valve stem
Replace
Damaged or worn valve guide
Replace
Oil pressure rise
Seizure, breakage or wear of piston ring
Flaws or wear of piston
Flaws or wear of liner
Leakage through cylinder head gasket
Over-cooling
Thermostat malfunction



Hydraulic pressure source



SECTION 3

ENGINE ASSEMBLY

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2. INSPECTION OF MAJOR COMPONENT PARTS 25

3. REASSEMBLY OF ENGINE 39

1. DISASSEMBLY OF ENGINE

1.1 Oil level Gauge

- Take out the oil level gauge.

1.2 Engine Oil

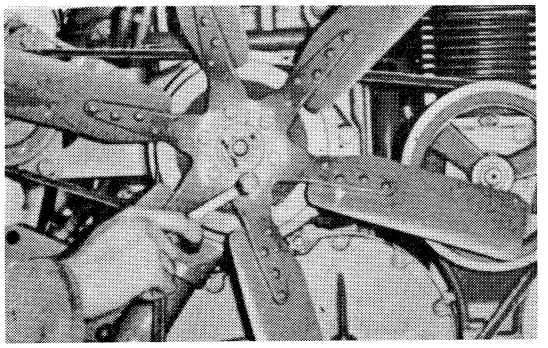
- Remove the drain plug from the oil pan and drain the engine oil
- Also drain the oil filter by removing the drain plug.

1.3 Cooling Water

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

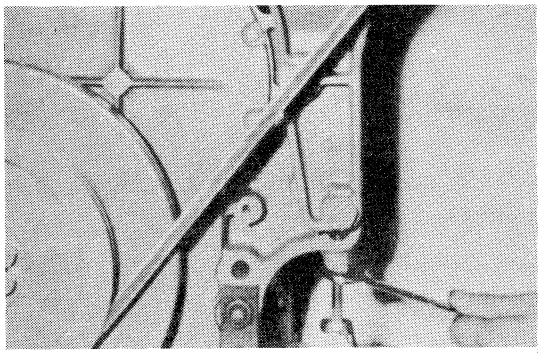
1.4 Cooling Fan

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

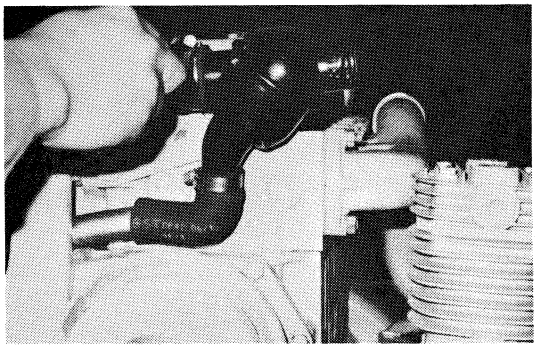


1.5 V-Belt

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

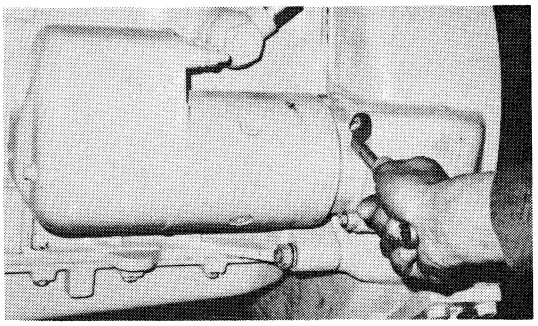


1.6 Thermostat



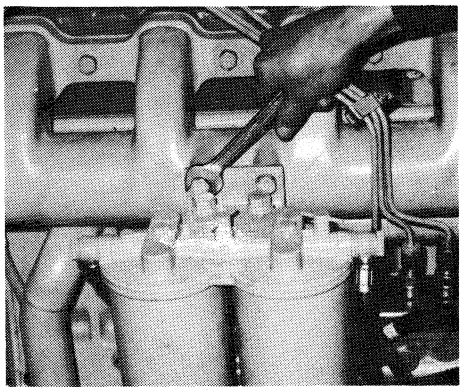
- Remove the thermostat.
- Remove the by-pass and rubber hoses.

1.7 Starter Motor



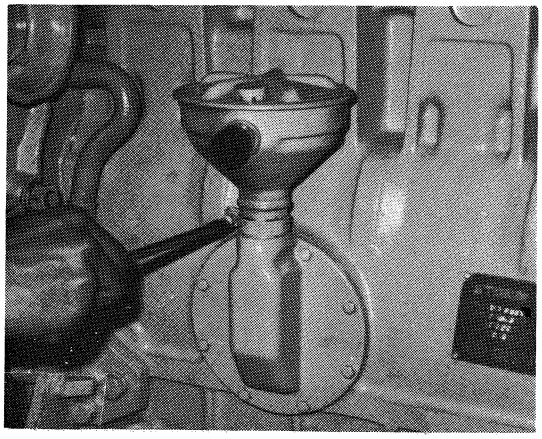
- Screw out the starter attaching nut and remove the starter.

1.8 Fuel Filter



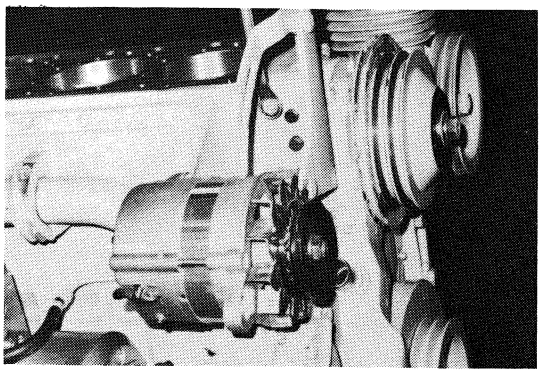
- Remove fuel hoses.
- Screw out the filter attaching bolts and take off the filter.

1.9 Breather Pipe



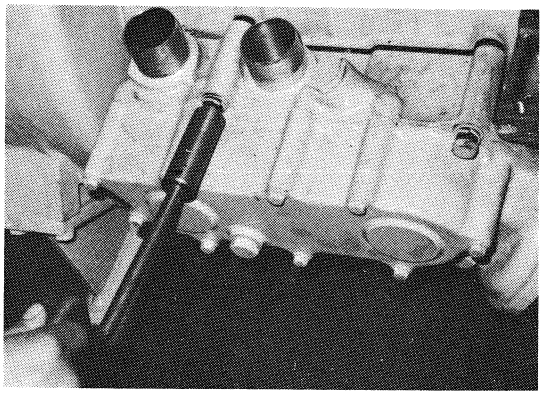
- Loosen the clamp screw of breather pipe.
- Remove the breather pipe.

1.10 Alternator

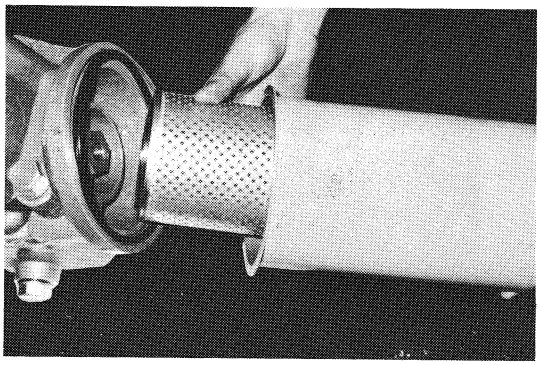


- Remove the alternator attaching bolts and take off alternator.

1.11 Oil Cooler, and Oil Filter

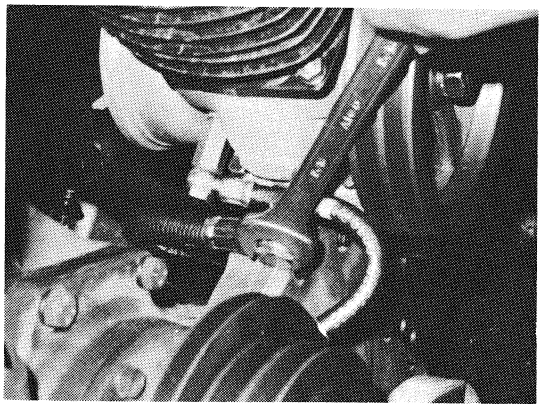


- Release the pipe clamp on the rubber joint from water pump to oil cooler and from oil cooler to thermostat.
- Screw off oil cooler attaching nuts and take off the oil cooler.



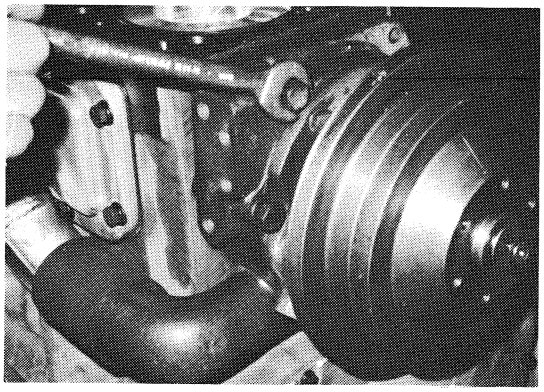
- Remove the oil filter from the oil cooler assembly.

1.12 Air Compressor and Idle Pulley



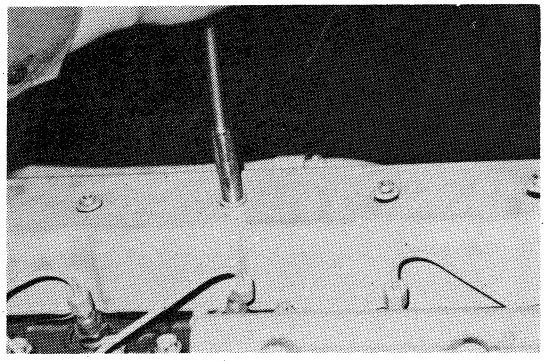
- Remove the oil pipes between cylinder block and air compressor.
- Unscrew the air compressor attaching bolts and remove the air compressor assembly.
- Unscrew the air compressor bracket attaching bolts and remove the bracket.

1.13 Water Pump



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

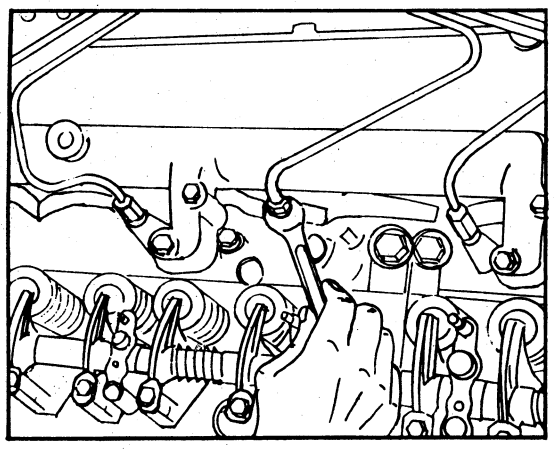
1.14 Cylinder Head Cover



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

1.15 Injection Nozzle

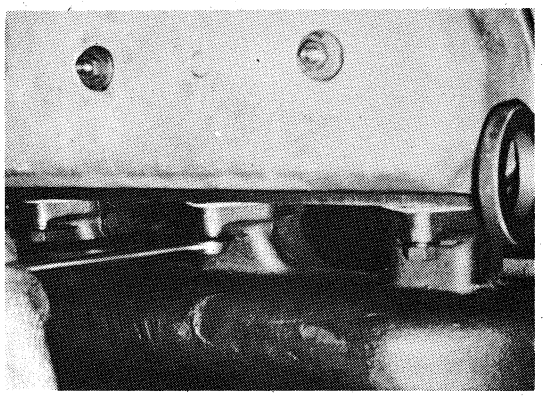
- Unscrew the fuel pressure pipes at nozzle holders and remove the pipes.



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

1.16 Exhaust Manifold

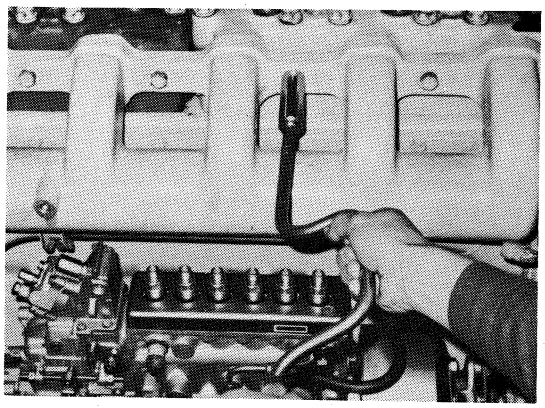
- Unscrew the exhaust manifold attaching bolts and remove the exhaust manifold from the cylinder head.



- Remove the exhaust manifold gasket and discard it.

1.17 Intake Manifold

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

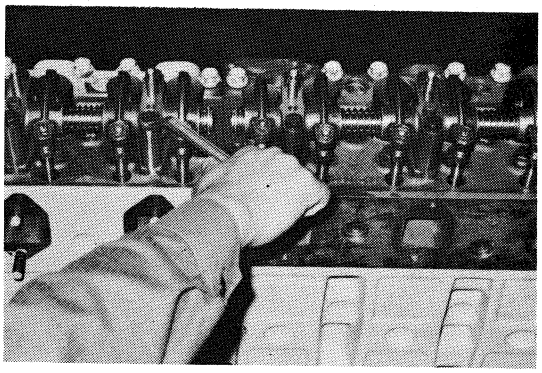


- Remove the intake manifold gasket and discard it.

1.18 Cooling Water Pipe

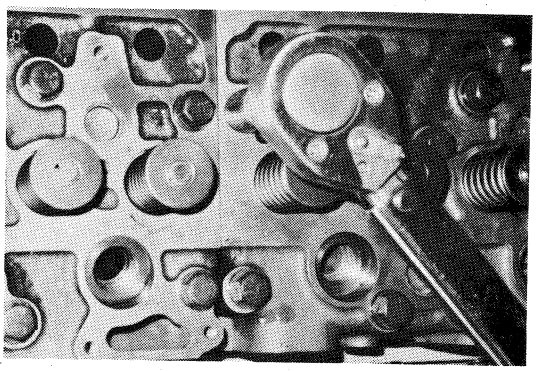
- Unscrew the cooling water pipe attaching bolts and remove from the cylinder head.
- Remove the cooling water pipe gasket and clean the surface using a suitable scraper.

1.19 Rocker Arm



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

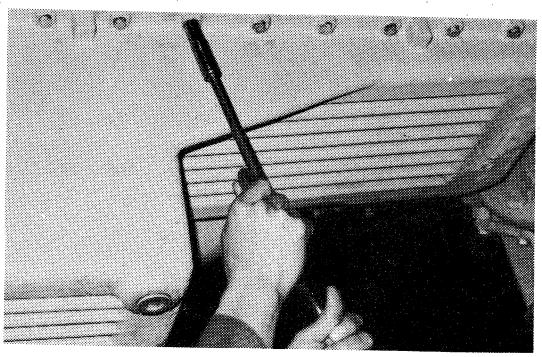
1.20 Cylinder Head



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

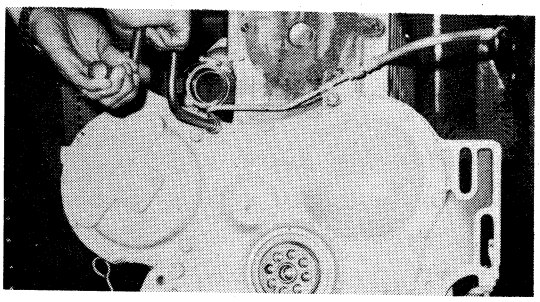
  Note : *Always loosen bolts in progression and avoid loosening bolts in localized area, or cylinder head distortion may result.*
- Take off cylinder head(s) and gasket(s).

1.21 Oil Pan



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

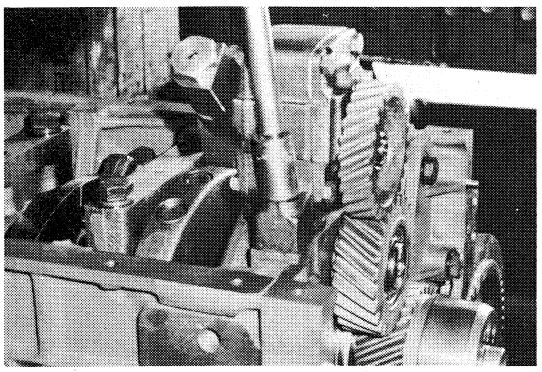
1.22 Timing Gear Case Cover



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

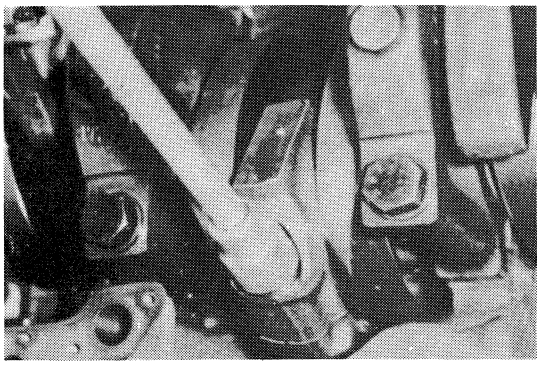
1.23 Oil Pump

- 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.

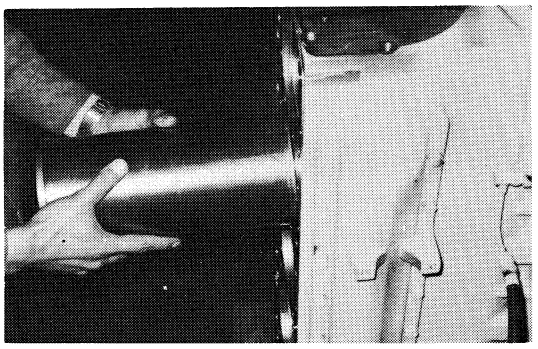
1.24 Piston



- 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.

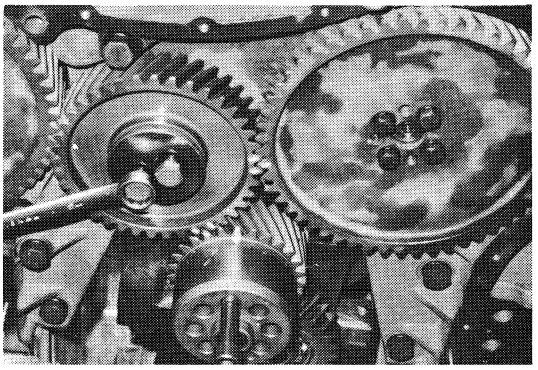
Note : *Remove connecting rod in parallel with cylinder bore to prevent scratching liner wall in contact with connecting rod.*

1.25 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.

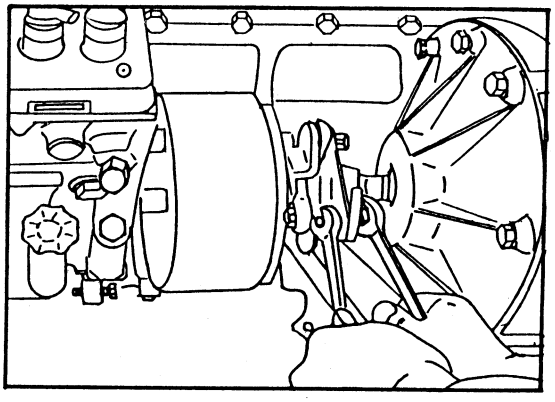
1.26 Gear and Idle Gear Pin



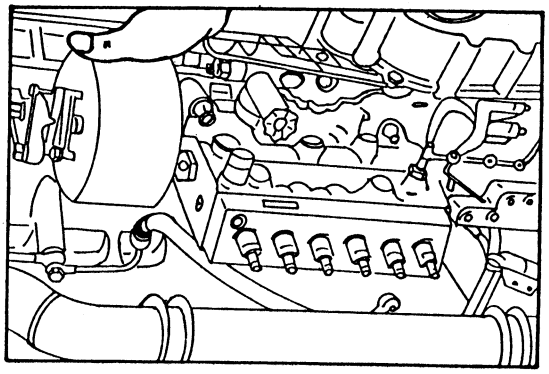
- Unscrew two bolts fixing the idle gear, then remove the idle gear with thrust washer.
- Unscrew the bolts mounting the camshaft gear, then remove the camshaft.
- Take off the idle gear pin.

1.27 Fuel Injection Pump

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

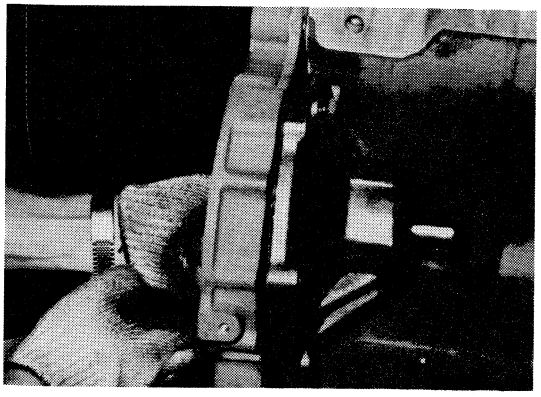


- Unscrew the coupling flange attaching bolts and nuts, using two wrenches.



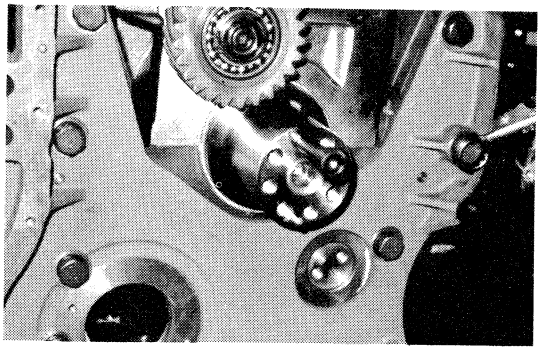
- Remove the bolts mounting the injection pump, then remove the injection pump upwards.
- Unscrew the injection pump bracket attaching bolts, then remove the bracket, tapping the upper and lower edge of bracket with a plastic hammer.

1.28 Injection Pump Drive Gear.



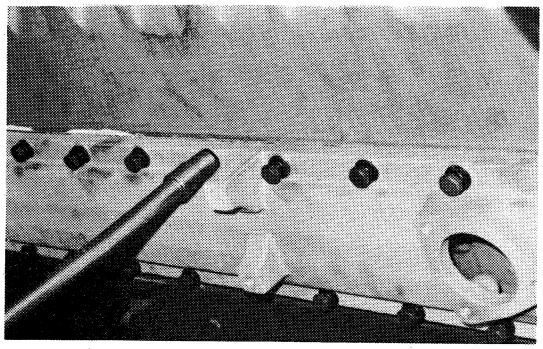
- Unscrew the bolts fixing the injection pump drive gear housing and remove the drive gear assembly.

1.29 Timing Gear Case



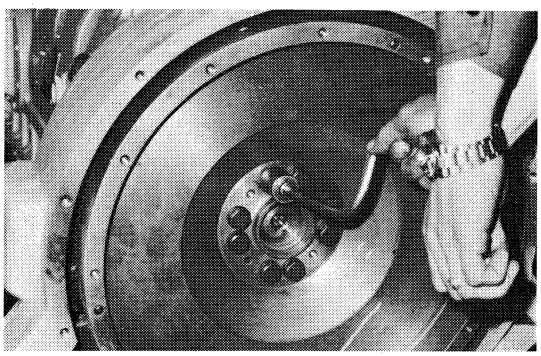
- Unscrew the bolts fixing the timing gear case.
- Remove the timing gear case, tapping the rear side of case with a plastic hammer.

1.30 Cooling Water Chamber Cover



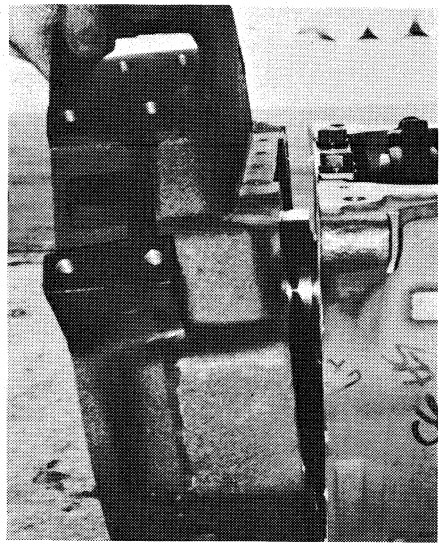
- Unscrew the chamber cover attaching bolts and remove the chamber cover.
- Remove gasket residue on the both side of cylinder block and chamber cover using a scraper.

1.31 Flywheel



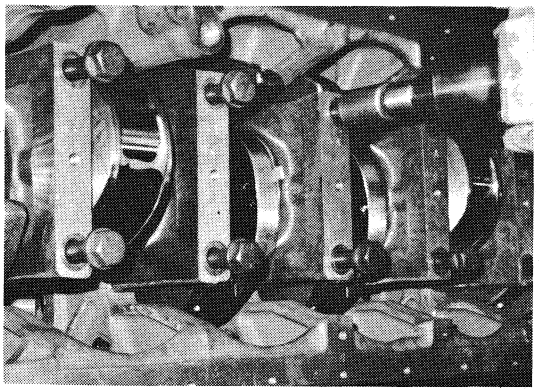
- Remove the bolts fixing the flywheel by loosening them in diagonal sequence.
- Remove the flywheel.

1.32 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 in the flywheel housing, then remove the oil seal.

1.33 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.

1.34 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.

1.35 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.