YANMAR

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SERVICE MANUAL

MARINE DIESEL ENGINE

2QM15

1989.9

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MODEL **2QM15**

FOREWORD

This service manual has been compiled for engineers engaged in the sales, service, inspection and maintenance of the 2QM15 marine diesel engine. Accordingly, descriptions of the construction and functions of the engine are emphasized in this manual while items which should already be common knowledge are omitted.

One characteristic of a marine diesel engine is that its performance in a vessel is governed by the applicability of the vessel's hull construction and its steering system.

Engine installation, fitting out and propeller selection have a substantial effect on the performance of the engine and the vessel. Moreover, when the engine runs unevenly or when trouble occurs, it is essential to check a wide range of operating conditions—such as installation to the hull and suitability of the ship's piping and propeller—and not just the engine itself. To get maximum performance from this engine, you should completely understand its functions, construction and capabilities, as well as proper use and servicing.

Use this manual as a handy reference in daily inspection and maintenance, and as a text for engineering guidance.

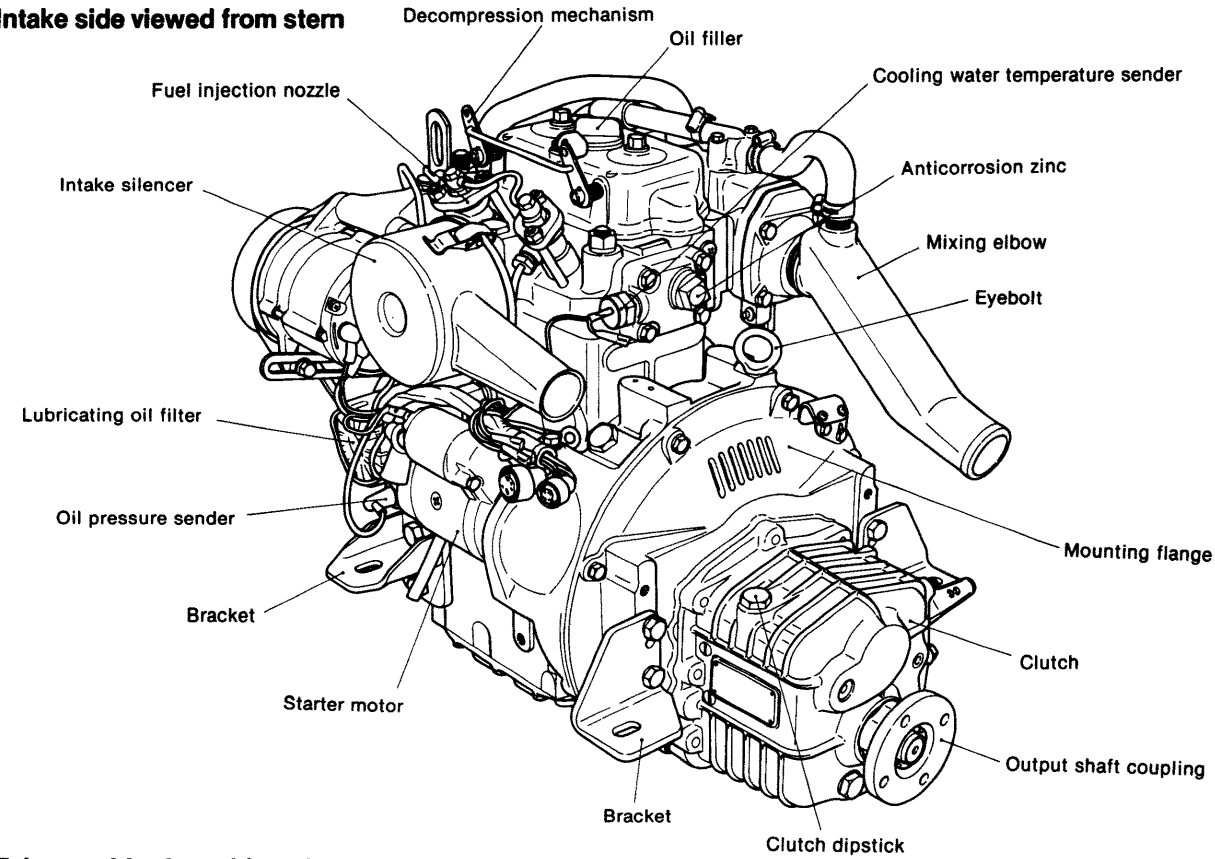
Model 2QM15

CHAPTER 1

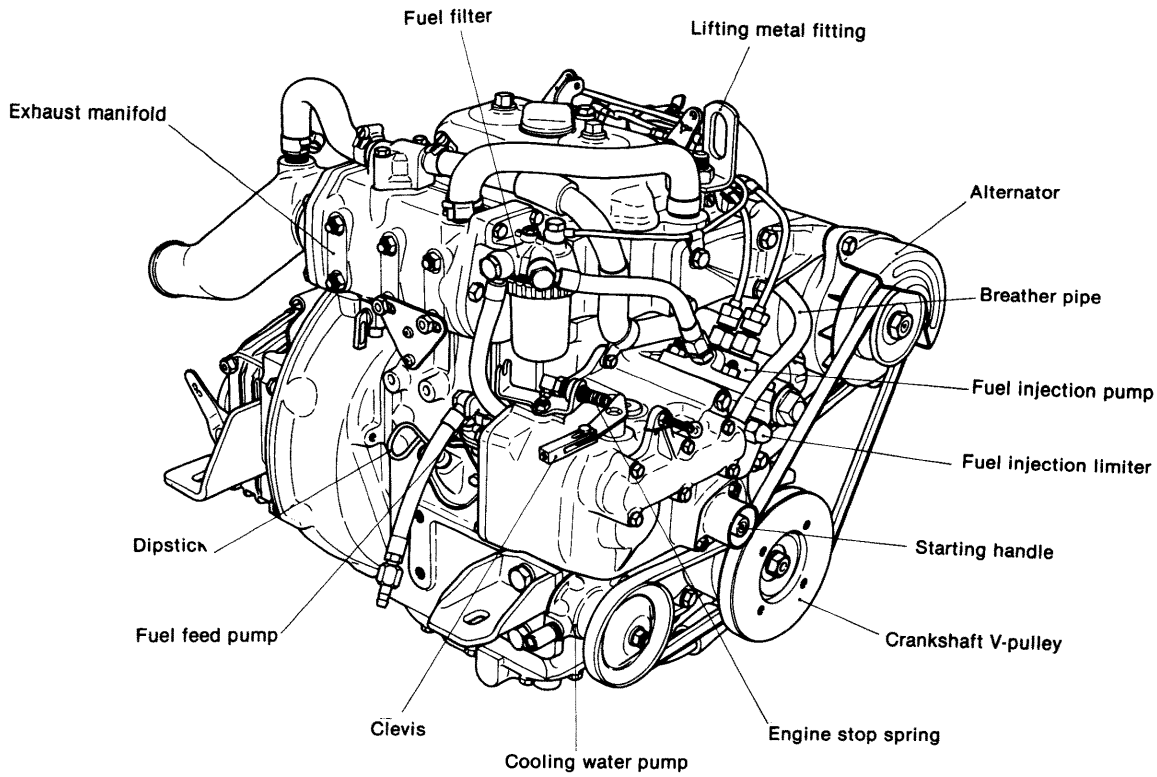
GENERAL

1. Exterior Views

1-1 Intake side viewed from stern



1-2 Exhaust side viewed from bow



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2. Specifications

Model			2QM15	2QM15G
Type			Vertical 4-cycle water-cooled diesel engine	
Combustion chamber			Precombustion type	
Number of cylinders			2	
Bore × stroke		mm	75 × 75	
Displacement		ℓ	0.662	
Continuous rated output (DINA)	Output/crankshaft speed	HP/rpm	14/3000	
	Brake mean effective pressure (BMEP)	kg/cm²/m/s	6.34/7.5	
	Propeller speed	rpm	1400	1060
One hour rating (DINB)	Output/crankshaft speed	HP/rpm	15/3000	
	Brake mean effective pressure (BMEP)	kg/cm²/m/s	6.80/7.5	
	Propeller speed	rpm	1400	1060
Compression ratio			23:1	
Fuel injection timing		deg	bTDC 27	
Fuel injection pressure		kg/cm²	160 ±10	
Engine weight (dry)		kg	145	
Power takeoff position			Flywheel side	
Direction of rotation	Crankshaft		Counterclockwise (viewed from clutch side)	
	Propeller shaft		Clockwise (viewed from clutch side)	
Cooling system			Sea water forced coofing (rubber impeller water pump)	
Lubrication system			Closed forced lubrication	
Starting system			Electric and manual	
Reduction gear system			Spur gear constant-mesh system	
Clutch			Wet multi-disc mechanical type	
Reduction ratio	Ahead		2.14	2.83
	Astern		2.50	2.50
Engine size	Overall length	mm	698	
	Overall width	mm	452	
	Overall height	mm	553	
Lubricating oil capacity (rake angle 8°)	Total	ℓ	2.5	
	Effective	ℓ	1.0	
Clutch	Total	ℓ	0.7	

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3. Principal Construction

Group	Part	Construction
Engine block	Cylinder block	Integrally-cast water jacket and crankcase
	Cylinder liner	Wet type coated with anticorrosion paint
	Main bearing	Metal housing type
	Oil sump	Oil pan
Intake and exhaust systems and valve mechanism	Cylinder head	Integrated two-cylinder
	Intake and exhaust valves	Poppet type, seat angle 90°
	Exhaust manifold	Integral water-cooled type
	Exhaust silencer	Water-cooled mixing elbow type (optional)
	Valve mechanism	Overhead valve push rod, rocker arm system
	Intake silencer	Round polyurethane sound absorbing type
Main moving elements	Crankshaft	Stamped forging
	Flywheel	Attached to crankshaft by flange, with ring gear
	Piston	Oval type
	Piston pin	Floating type
	Piston rings	3 compression rings, 1 oil ring
Lubrication system	Oil pump	Trochoid pump
	Oil filter	Full-flow cartridge type, paper element
	Oil level gauge	Dipstick
Cooling system	Water pump	Rubber impeller type
	Thermostat	Wax pellet type
Bilge system	Bilge pump	Rubber impeller (tandem type) combined with C.W. pump (optional)
Fuel system	Fuel injection pump	Bosch integral 2-cylinder type
	Fuel injection valve	530 semi-throttle valve
	Fuel strainer	Filter paper
Governor	Governor	Centrifugal all-speed mechanical type
Starting system	Electric	Pinion ring gear type starter motor
	Manual	Camshaft starting
Electrical system	Charger	Alternator (with built-in IC regulator)
Reduction reversing	Reduction gear	Spur gear constant-mesh system
Clutch system	Clutch	Wet multi-disc mechanical type

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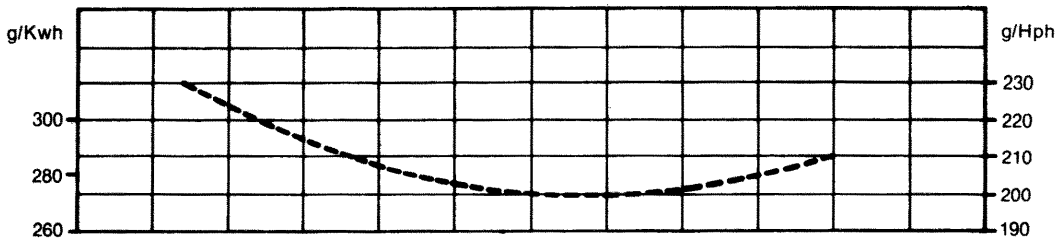
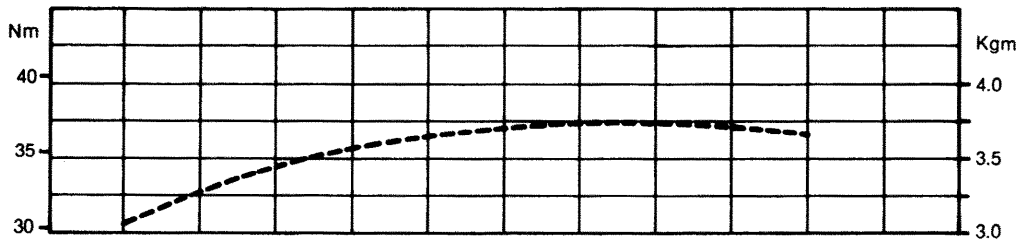
4. Performance Curves

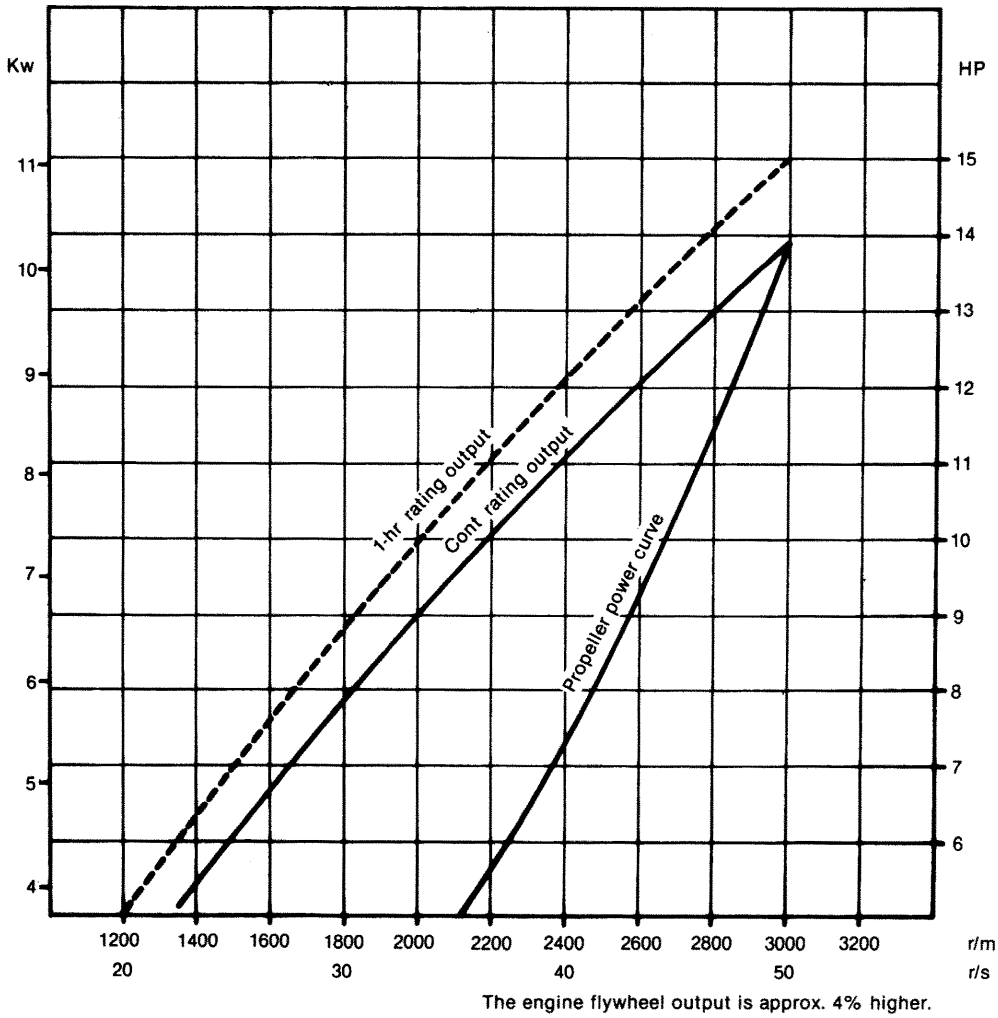
Fuel consumption at flywheel output



Torque measured at the flywheel



Output measured at the propeller shaft



The engine flywheel output is approx. 4% higher.

5. Features

1. Superior combustion performance
The unique Yanmar swirl precombustion chamber combustion system and new cooling system display superior combustion performance in all types of operation. Low-speed, low-load combustion performance, especially demanded for marine applications, is also superb, and stable performance is maintained over a wide range of speeds. Since starting characteristics are also excellent and warm-up is fast, full engine performance can be obtained within a short time.

2. Low operating costs
Excellent combustion and low friction reduce fuel costs, while the optimized piston shape and ring configuration and improved cooling system reduce oil consumption. Continuous operating time has been extended and operating costs reduced through improved durability.

3. Compact, lightweight
The cylinder head is an integrally-cost two cylinder type, and the crankshaft is the housing type without an intermediate bearing. Minimum weight has been pursued for each engine part, and a reduction reversing gear employing a special new mechanism has been incorporated to obtain revolutionary engine lightness.

4. Long term continuous operation
Improved durability has been achieved by adopting special construction and materials for main moving parts and the valve mechanism, which are the areas most subject to trouble in high-speed engines. Moreover, a bypass system with a thermostat maintains the cooling water at a stable high temperature, resulting in reduced cylinder liner and piston ring wear, reduced thermal load around the combustion chamber, and substantially improved durability. Long-term continuous operation is possible by correct operation and proper attention to fuel and lubricating oil.

5. Low vibration
Vibration has been reduced by minimizing the weights of the pistons, connecting rods, and other sources of vibration, stringent weight management at assembly, and balancing of the flywheel, V-pulley, etc. Vibration has also been suppressed through the adoption of a special cylinder block rib construction and improved rigidity. Rubber shock mounts are available when the engine is to be used under conditions which may lead to severe vibration.

6. Quiet operation
Intake and exhaust noises have been lowered by adopting an intake silencer, water-cooled exhaust manifold and water mixing elbow type exhaust system.
The precombustion chamber system and semi-throttle type injection valve suppress combustion noise substantially.
Moreover, gear noise has been reduced by the use of helical gears around the gear train and clutch gear, and by the buffering effect of a damper disc.
In addition, noise prevention measures have also been taken at the control valve mechanism and other parts.

7. Superior matching to the hull
(1) Four-point support engine installation feet make installation easy.
(2) Mist intake system prevents contamination of the engine room.
(3) Since the fuel pump is mounted to the engine, the fuel tank can be installed anywhere.
(4) Water-cooled manifold prevents a rise in the engine temperature.
(5) Independent type instrument panel can be installed wherever it is easiest to see.
(6) Speed, clutch forward and reverse, decompression and engine stop can all be remotely controlled.
(7) The use of rubber and vinyl hoses for ship interior piping not only facilitates piping work, but also eliminates brazing faults caused by vibration.
(8) Tandem type cooling water/bilge pump is available as an option.

8. Easy to operate
(1) Cooling water temperature switch and lubricating oil pressure switch are provided, and alarm lamps and buzzer are mounted on the instrument panel.
(2) Threaded hole in the V-pulley permits front power take-off.
(3) Hole for manual starting handle permits manual starting.
(4) Positive clutch engagement and disengagement; propeller shaft does not rotate when clutch is placed in Neutral position.

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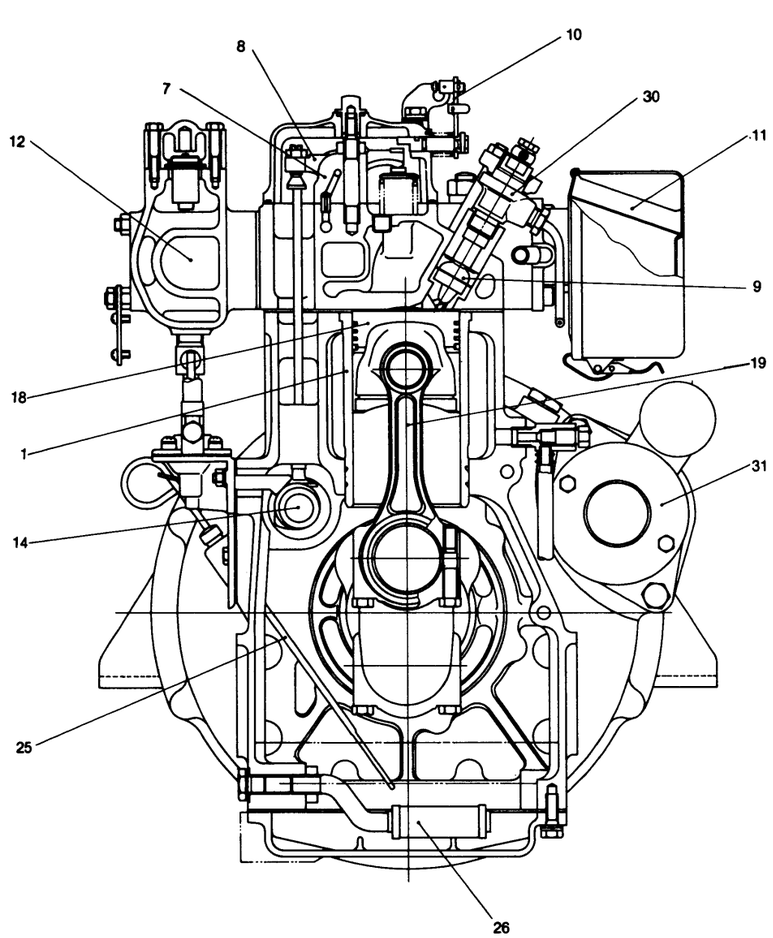
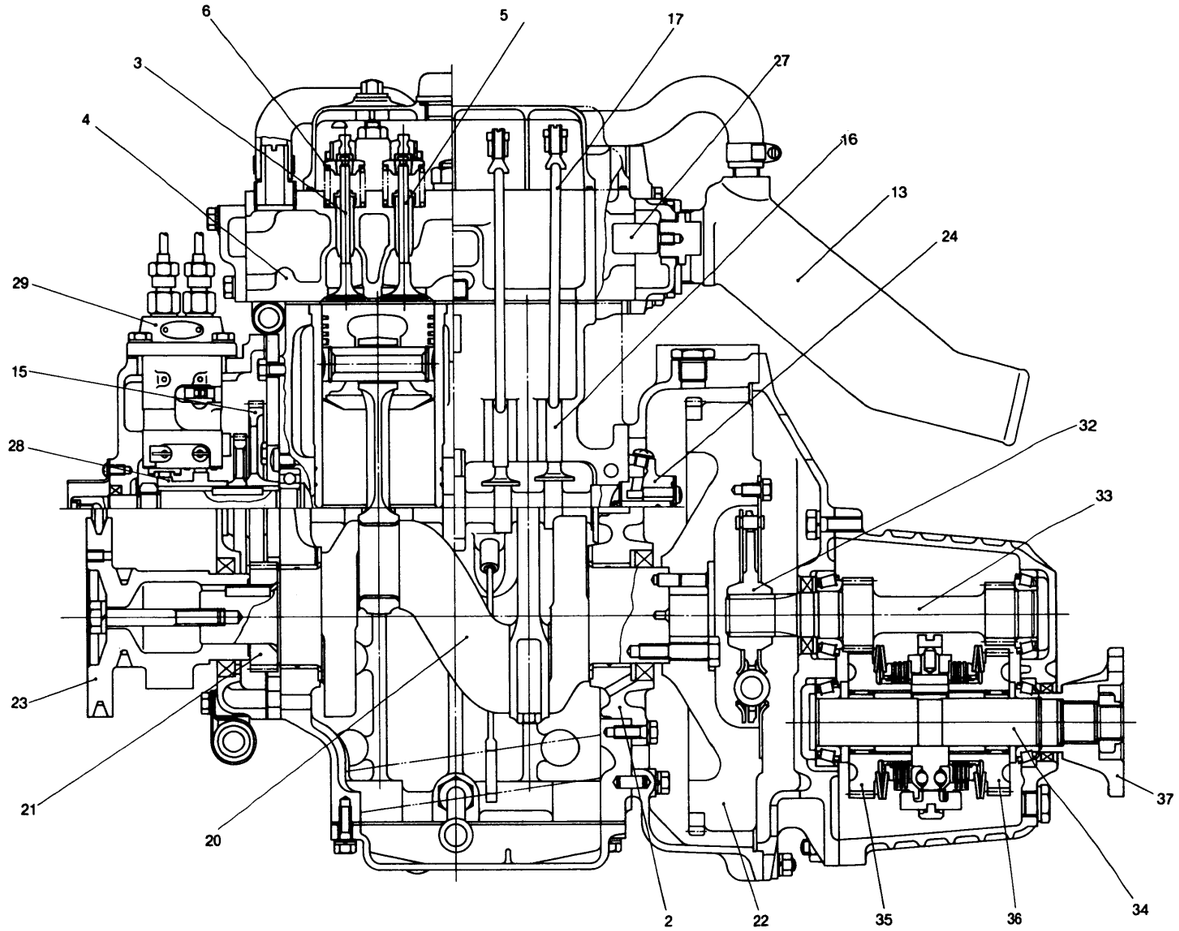
6. Engine Cross-section





1. Cylinder liner
2. Main bearing housing
3. Cylinder head
4. Exhaust valve
5. Intake valve
6. Valve spring
7. Valve rocker arm support
8. Valve rocker arm
9. Precombustion chamber
10. Decompression lever
11. Intake silencer
12. Exhaust manifold
13. Mixing elbow
14. Camshaft
15. Camshaft gear
16. Tappet
17. Push rod
18. Piston
19. Connecting rod
20. Crankshaft
21. Crankshaft gear
22. Flywheel
23. Crankshaft V-pulley
24. Lubricating oil pump
25. Dipstick
26. Lubricating oil inlet pipe
27. Anticorrosion zinc
28. Fuel injection pump cam
29. Fuel injection pump
30. Fuel injection nozzle
31. Alternator
32. Damper disc
33. Input shaft
34. Output shaft
35. Forward large gear
36. Reverse large gear
37. Output shaft coupling

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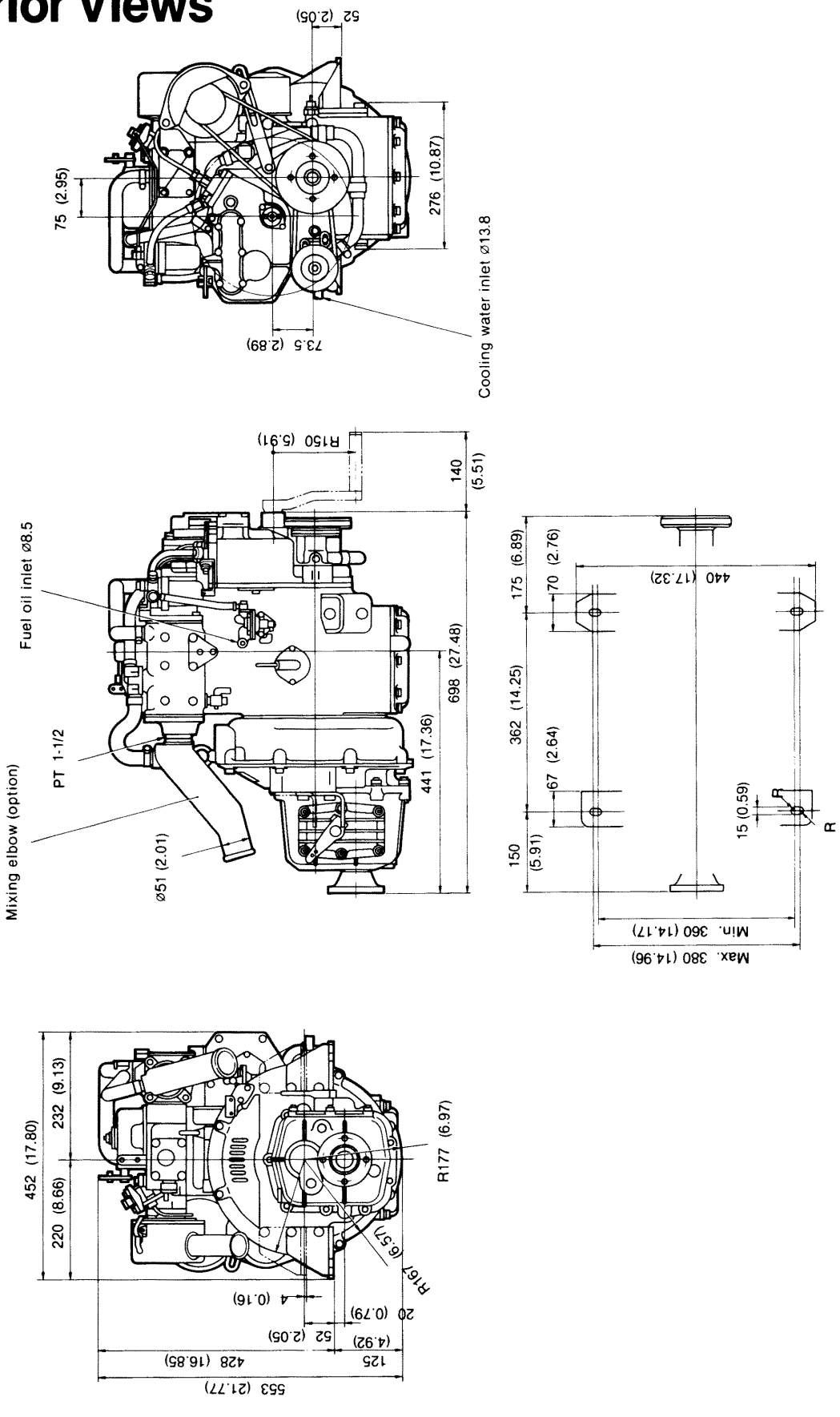
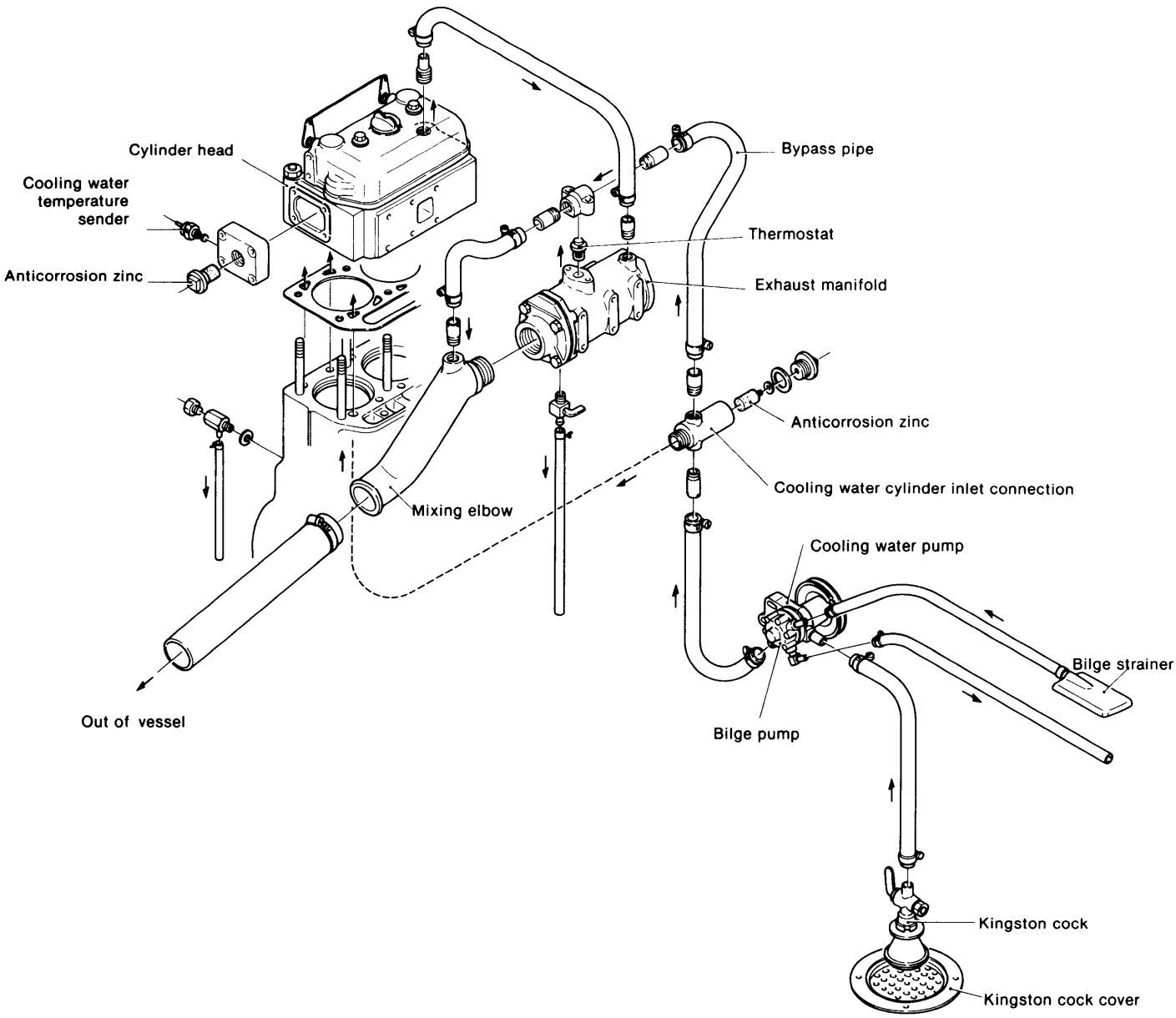
7. Exterior Views

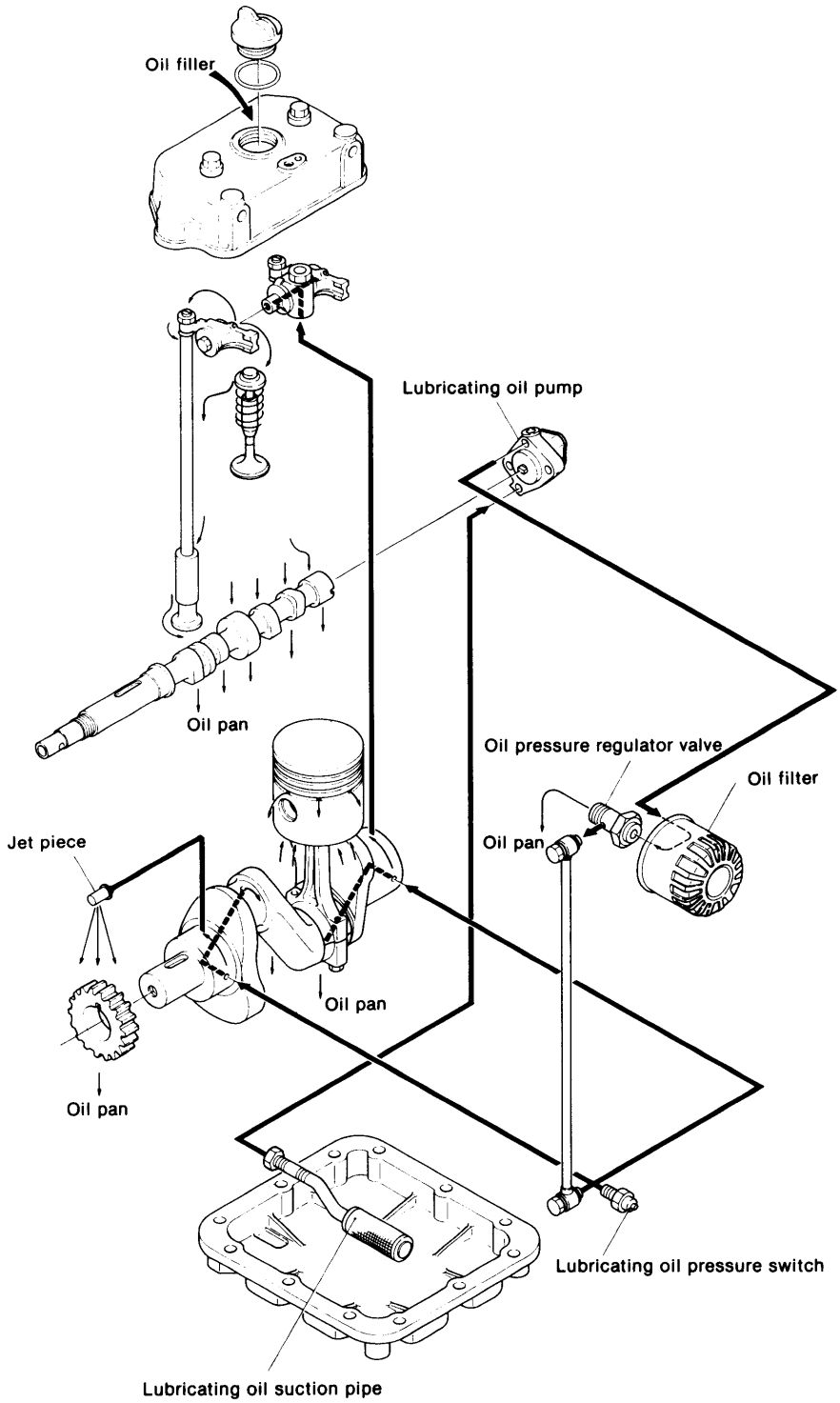


8. System Diagrams

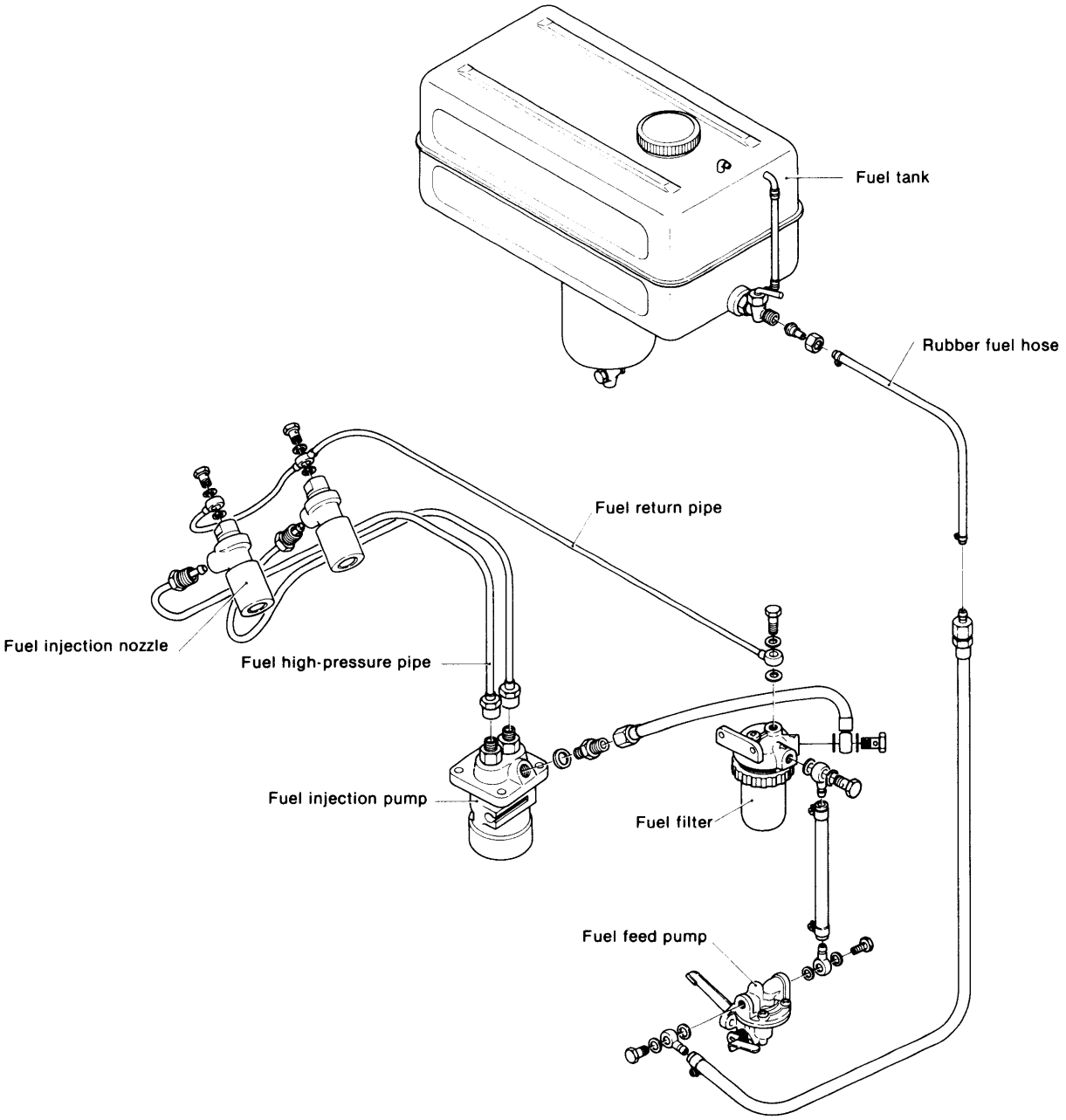
8-1 Cooling system



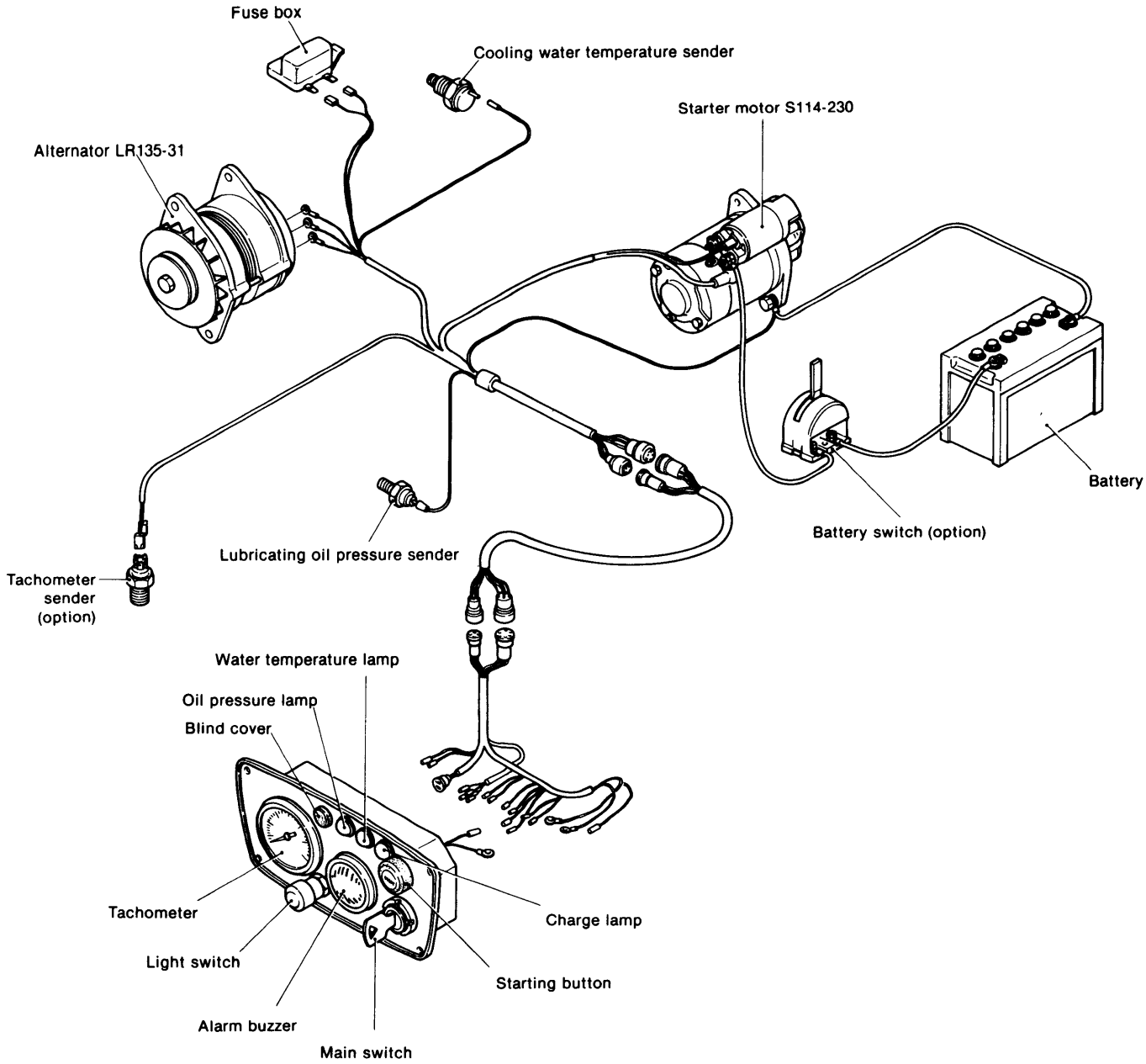
8-2 Lubrication system



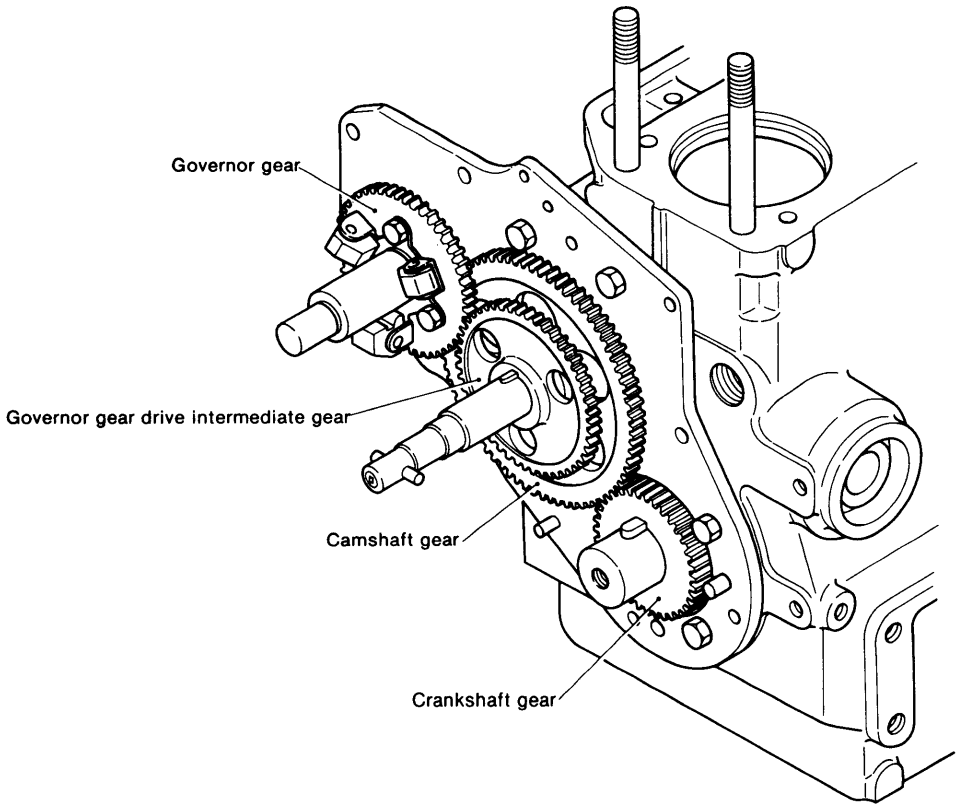
8-3 Fuel system



8-4 Electrical system

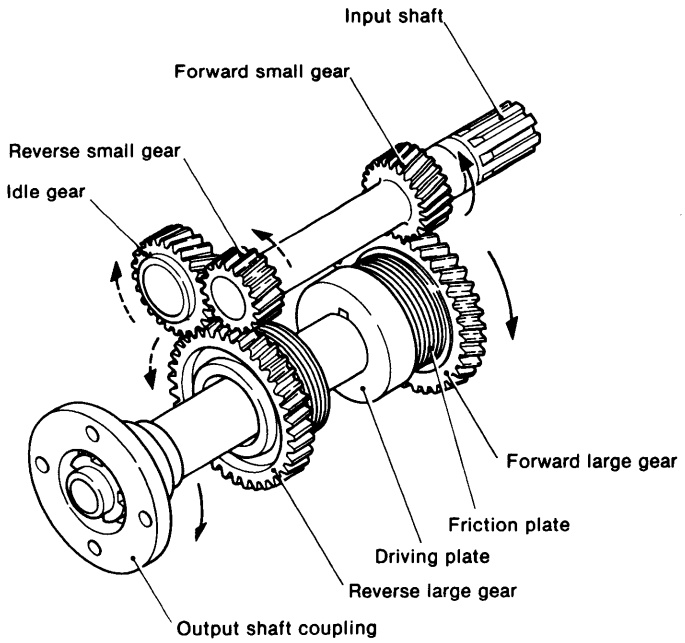


8-5 Timing gear train

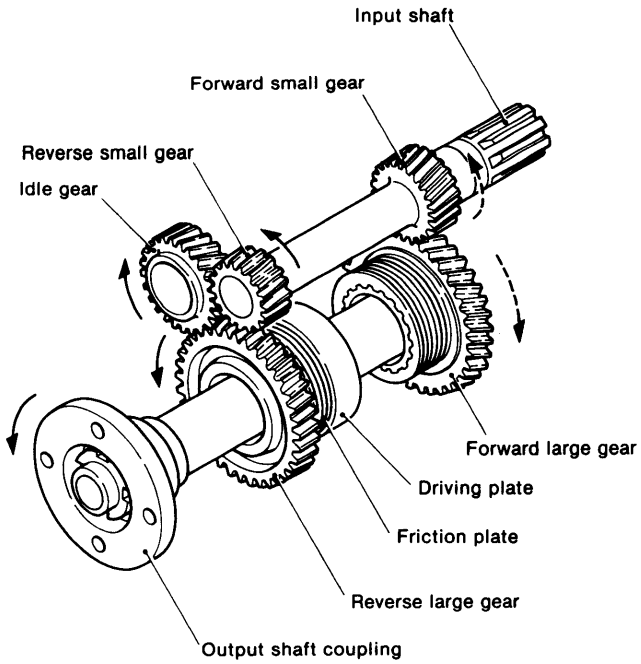


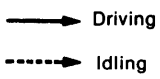
8-6 Reduction reversing power transmission system

Forward

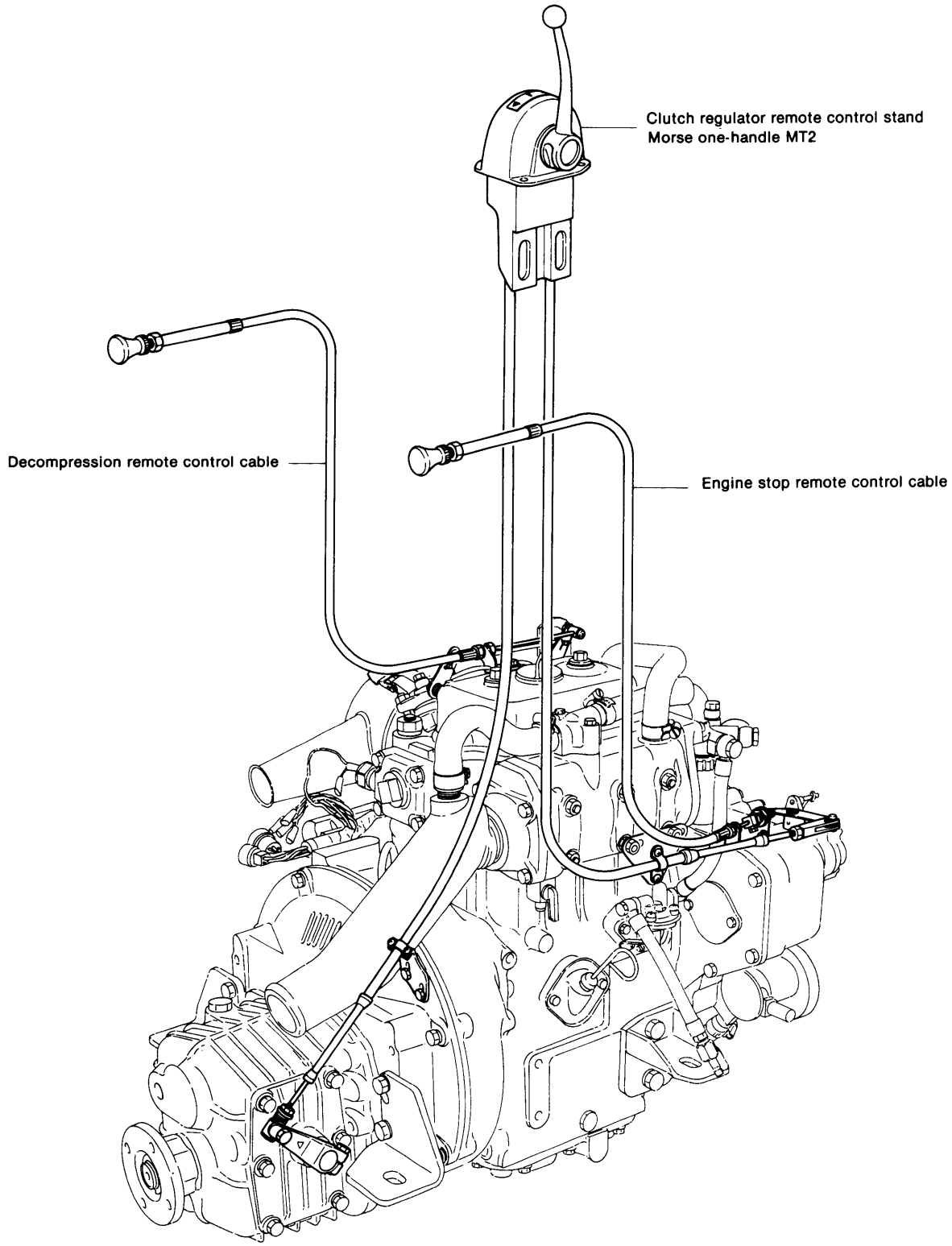


Reverse





8-7 Remote control system



9. Standard Accessories

9-1 Parts packed with engine

The parts packed with the engine are listed below.

Part name	Remarks
Instrument panel ass'y	
Starting handle	
Tool box	
Operating manual	

9-2 Parts mounted on engine

The parts mounted to the engine are listed below.

Part name	Remarks
Intake silencer	
Exhaust manifold	
Water pump	
Feed pump	
Fuel strainer	
Oil strainer	
Oil pressure switch	
Water temperature switch	
Thermostat	
Starter motor	
Alternator (with ICR)	
Wiring harness	
Speed remote control bracket	
Engine stop remote control bracket	
Engine stop device	
Clutch remote control bracket (bow)	
Decompression remote control bracket	
Fuse box	