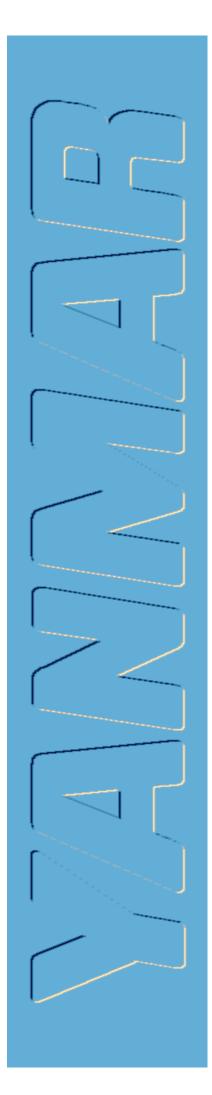


SERVICE MANUAL

MARINE DIESEL ENGINE

2QM15



SERVICE MANUAL

MARINE DIESEL ENGINE

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**

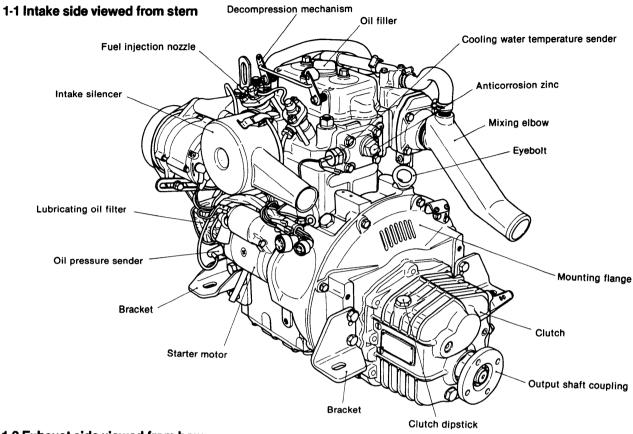
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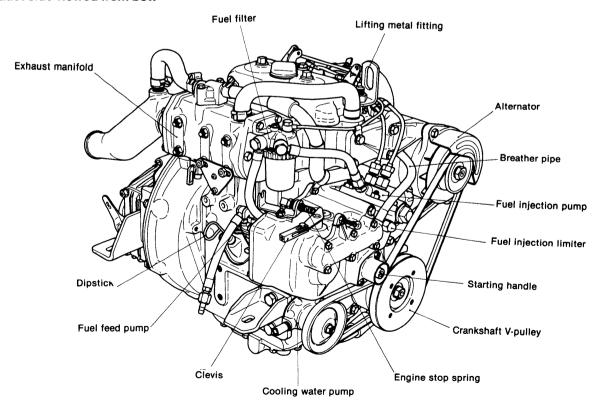
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1. Exterior Views



1-2 Exhaust side viewed from bow



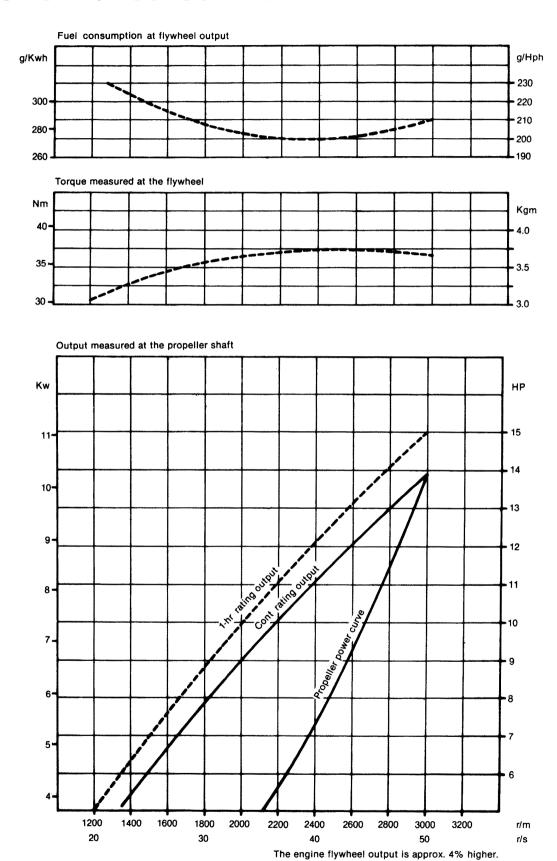
2. Specifications

| | Model | | 2QM15 | 2QM15G | |
|--------------------------|--|------------|---|---------------------------|--|
| | Туре | | Vertical 4-cycle wa | ater-cooled diesel engine | |
| Combustion | chamber | | Precombustion typ | ре | |
| Number of o | eylinders | | | 2 | |
| Bore × strok | е | mm | 75 | 5 × 75 | |
| Displacemer | nt | Į. | | 0.662 | |
| Continuous rated | 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 | |
| | 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 | n ratio | | | 23:1 | |
| Fuel injection | n timing | deg | ьт | DC 27 | |
| Fuel injection | n pressure | kg/cm² | 160 ±10 | | |
| Engine weigl | ht (dry) | kg | | 145 | |
| | | | | | |
| Power takeo | ff position | | Flywheel side | | |
| | Crankshaft | | Counterclockwise (viewed from clutch side) | | |
| Direction of rotation | Propeller shaft | | Clockwise (viewed from clutch side) | | |
| Cooling system | em | | Sea water forced coofing (rubber impeller water pump) | | |
| Lubrication s | system | | Closed forced lubr | ication | |
| Starting syst | em | | Electric and manua | al | |
| Reduction ge | ear system | | Spur gear constant-mesh system | | |
| Clutch | A STATE OF THE STA | | Wet multi-disc me | chanical type | |
| | Ahead | | 2.14 | 2.83 | |
| Reduction ratio | Astern | | 2.50 | 2.50 | |
| Engine size | Overall length | mm | | 698 | |
| | Overall width | mm | 452 | | |
| | Overall height | mm | 553 | | |
| Lubricating oil capacity | ty Total | 1 | 2.5 | | |
| (rake angle 8°) | Effective | 1 | 1.0 | | |
| Clutch | Total | 1 | | 0.7 | |

3. Principal Construction

| Group | Part | Construction | |
|--|---------------------------|--|--|
| | Cylinder block | Integrally-cast water jacket and crankcase | |
| | Cylinder liner | Wet type coated with anticorrosion paint | |
| Engine block | Main bearing | Metal housing type | |
| | Oil sump | Oil pan | |
| | Cylinder head | Integrated two-cylinder | |
| | Intake and exhaust valves | Poppet type, seat angle 90° | |
| Intake and exhaust systems | Exhaust manifold | Integral water-cooled type | |
| and valve mechanism | Exhaust silencer | Water-cooled mixing elbow type (optional) | |
| | Valve mechanism | Overhead valve push rod, rocker arm system | |
| | Intake silencer | Round polyurethane sound absorbing type | |
| | Crankshaft | Stamped forging | |
| | Flywheel | Attached to crankshaft by flange, with ring gear | |
| Main moving elements | 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 | |
| | Water pump | Rubber impeller type | |
| Cooling system | Thermostat | Wax pellet type | |
| Bilge system | Bilge pump | Rubber impeller (tandem type) combined with C.W. pump (optional) | |
| 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1 | Fuel injection pump | Bosch integral 2-cylinder type | |
| Fuel system | Fuel injection valve | 530 semi-throttle valve | |
| | Fuel strainer | Filter paper | |
| Governor | Governor | Centrifugal all-speed mechanical type | |
| | Electric | Pinion ring gear type starter motor | |
| Starting system | Manual | Carnshaft 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 | |

4. Performance Curves



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

In addition, noise prevention measures have also been taken at the control valve mechanism and other parts.

7. Superior matching to the hull

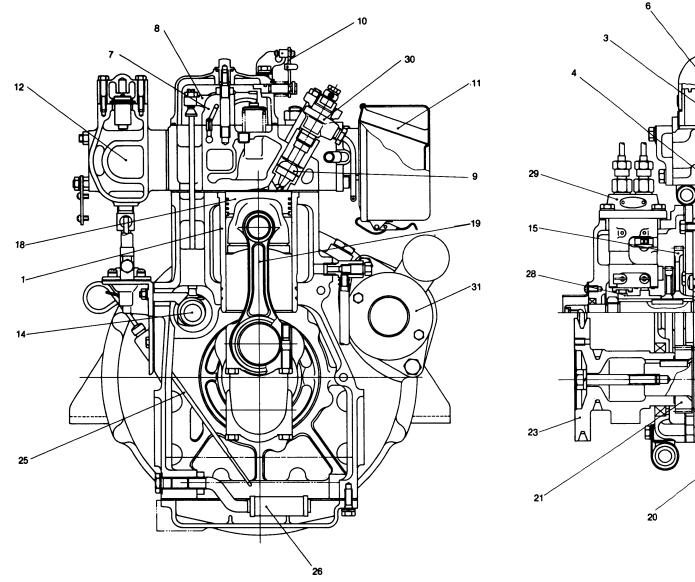
the buffering effect of a damper disc.

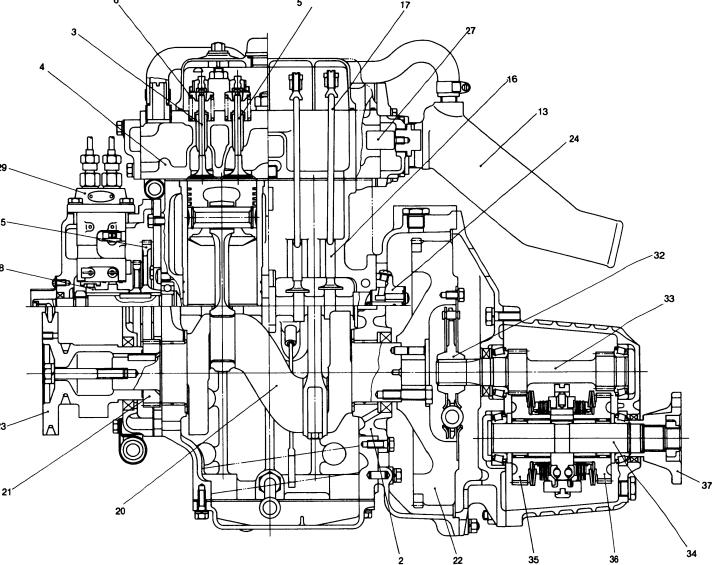
- Four-point support engine installation feet make installation easy.
- (2) Mist intake system prevents contamination of the engine room.
- (3) Since the fuel pump is mounted to the engine, the fuel tank can be installed anywhere.
- (4) Water-cooled manifold prevents a rise in the engine temperature.
- (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 takeoff.
- (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.

6. Engine Cross-section



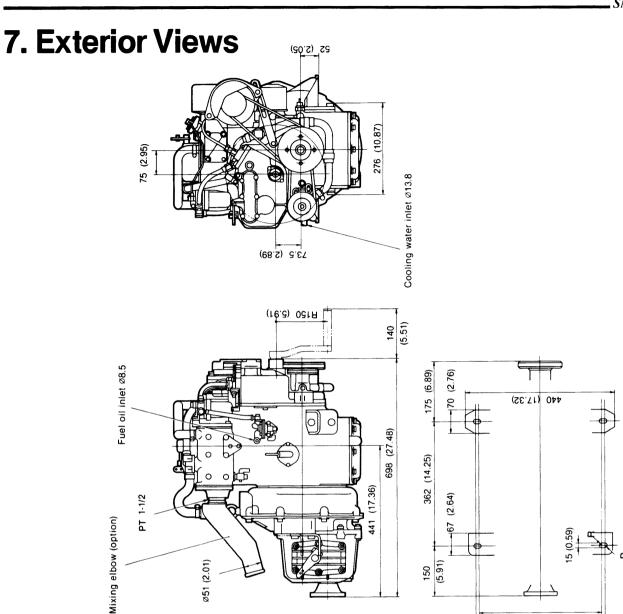


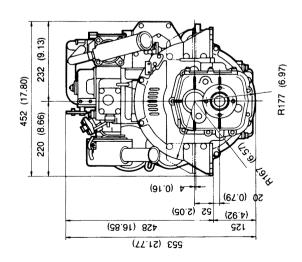
- Cylinder liner
 Main bearing housing
- 3. Cylinder head
- 4. Exhaust valve
- 5. Intake valve
- 6. Valve spring
- 7. Valve rocker arm support
- Valve rocker arm
 Precombustion chamber
- 10. Decompression lever
- 11. Intake silencer12. Exhaust manifold13. Mixing elbow
- 14. Camshaft
- 15. Camshaft gear
- 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

- 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





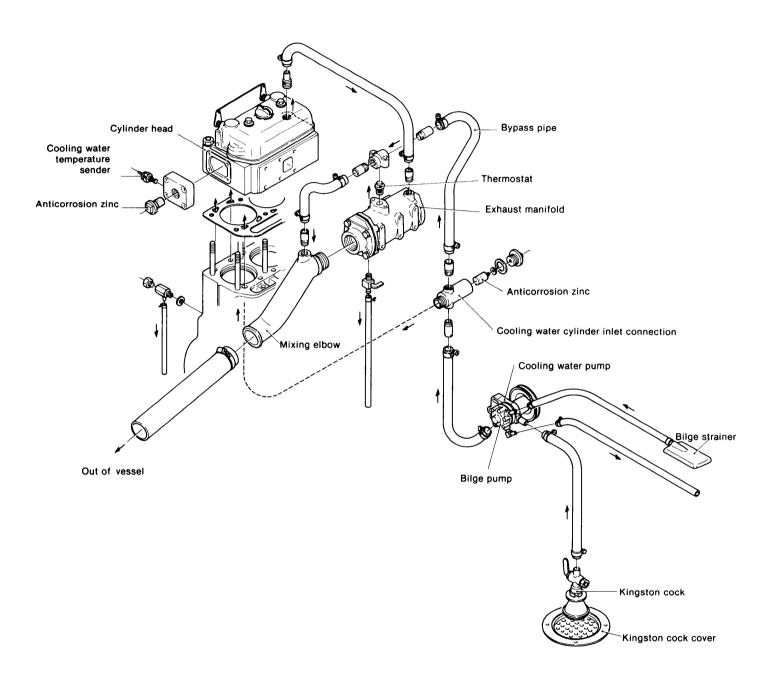
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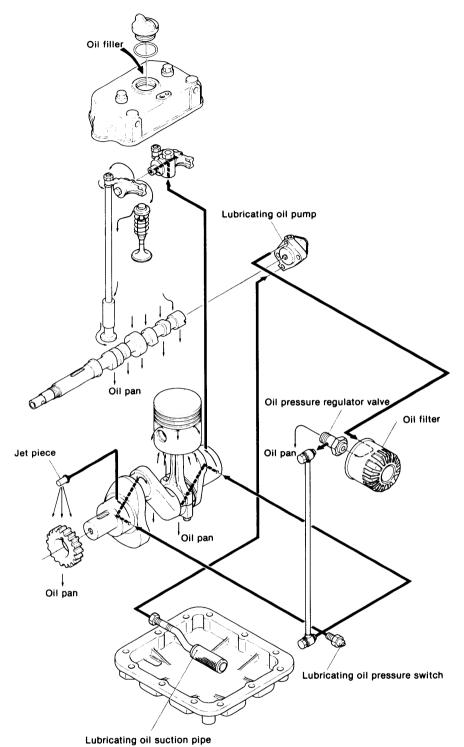
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8. System Diagrams

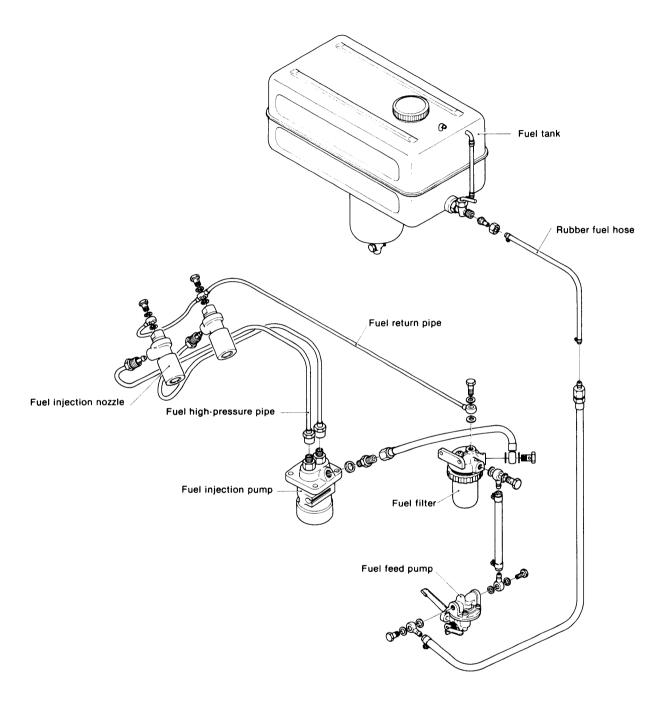
8-1 Cooling system



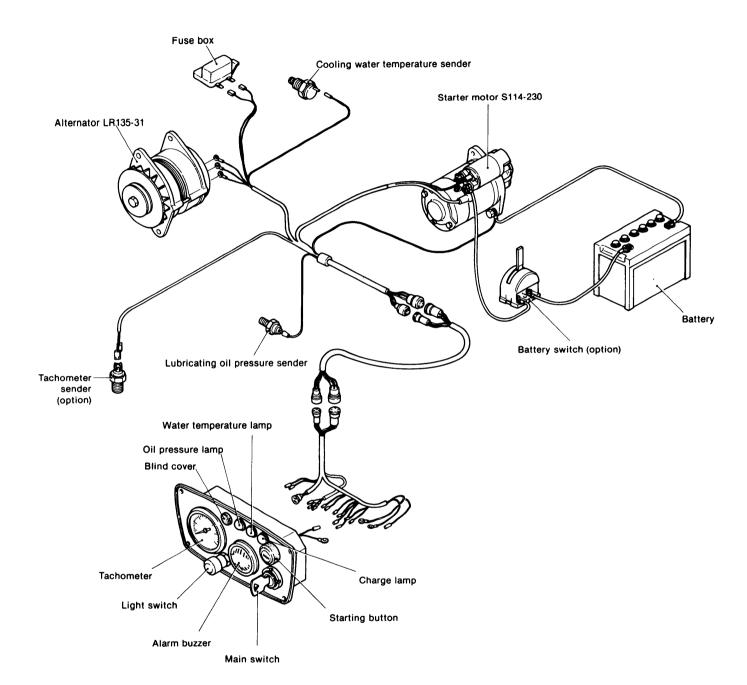
8-2 Lubrication system



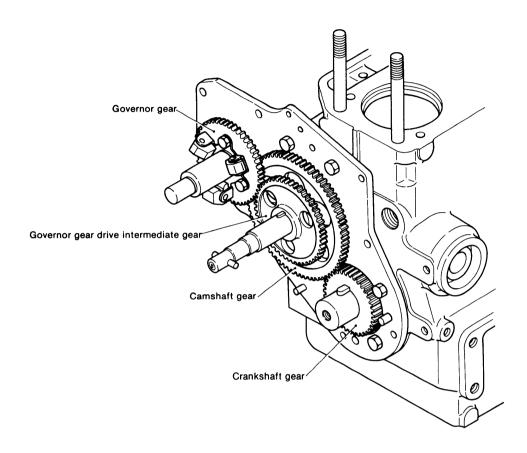
8-3 Fuel system



8-4 Electrical system



8-5 Timing gear train



8-6 Reduction reversing power transmission system

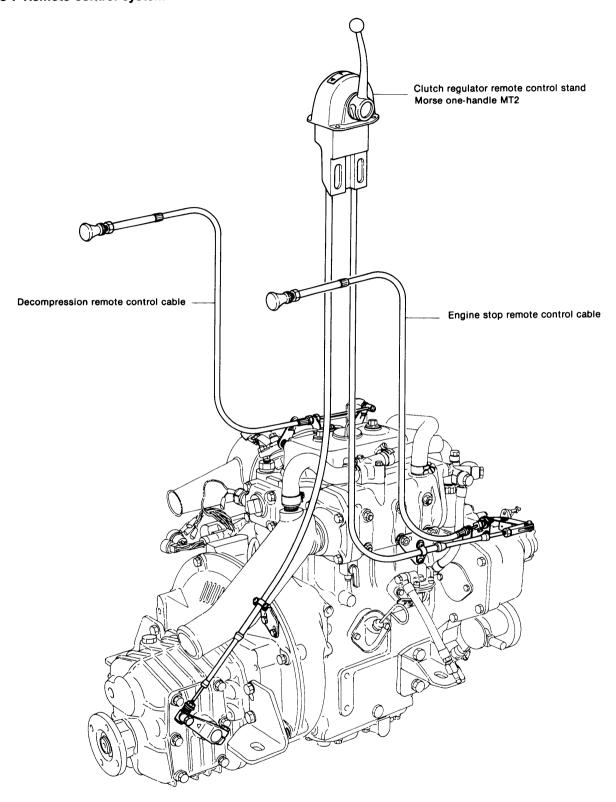
Forward small gear Idle gear Idle gear Friction plate Driving plate Reverse large gear

Reverse small gear Idle gear Forward small gear Forward large gear Driving plate Friction plate Reverse large gear Output shaft coupling

Output shaft coupling

------ Idling

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 | |