YANMAR

0000A0A1001-9008

SERVICE MANUAL

MARINE DIESEL ENGINE

YSM

1990.8

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MARINE DIESEL ENGINE

MODEL YSM

FOREWORD

This service manual has been compiled for engineers engaged in the sales, service, inspection and maintenance of the YSM marine diesel engines. 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.

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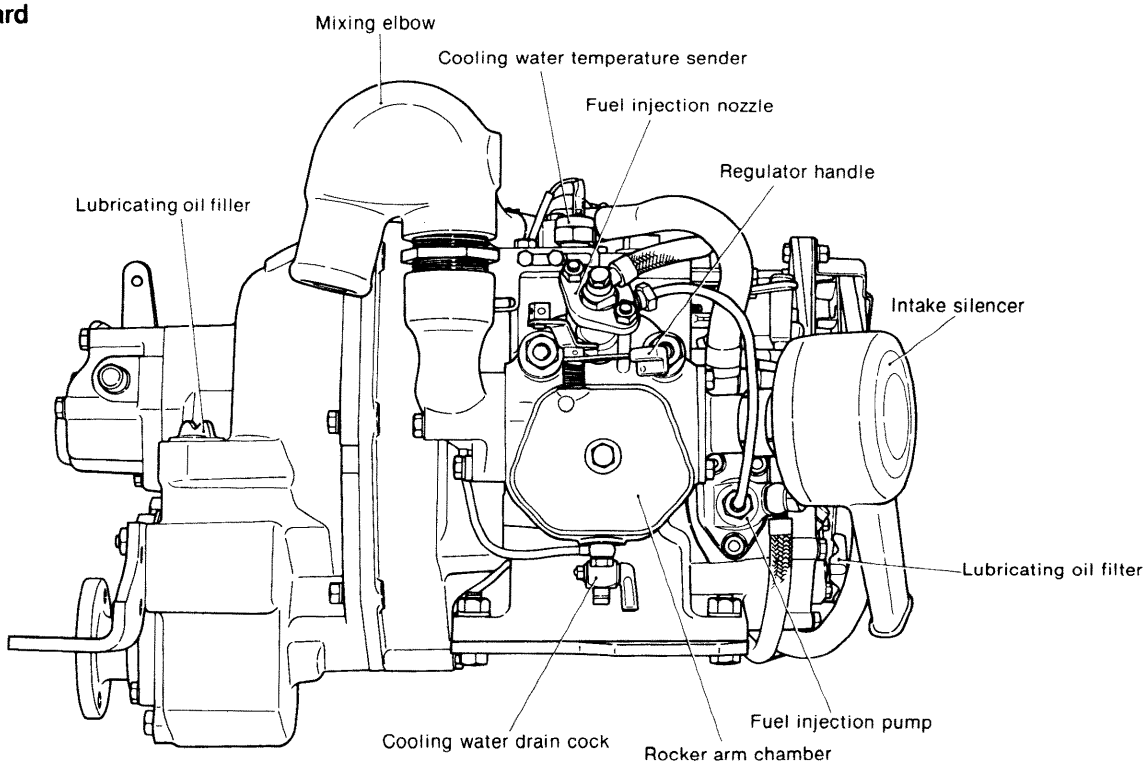
CHAPTER 1

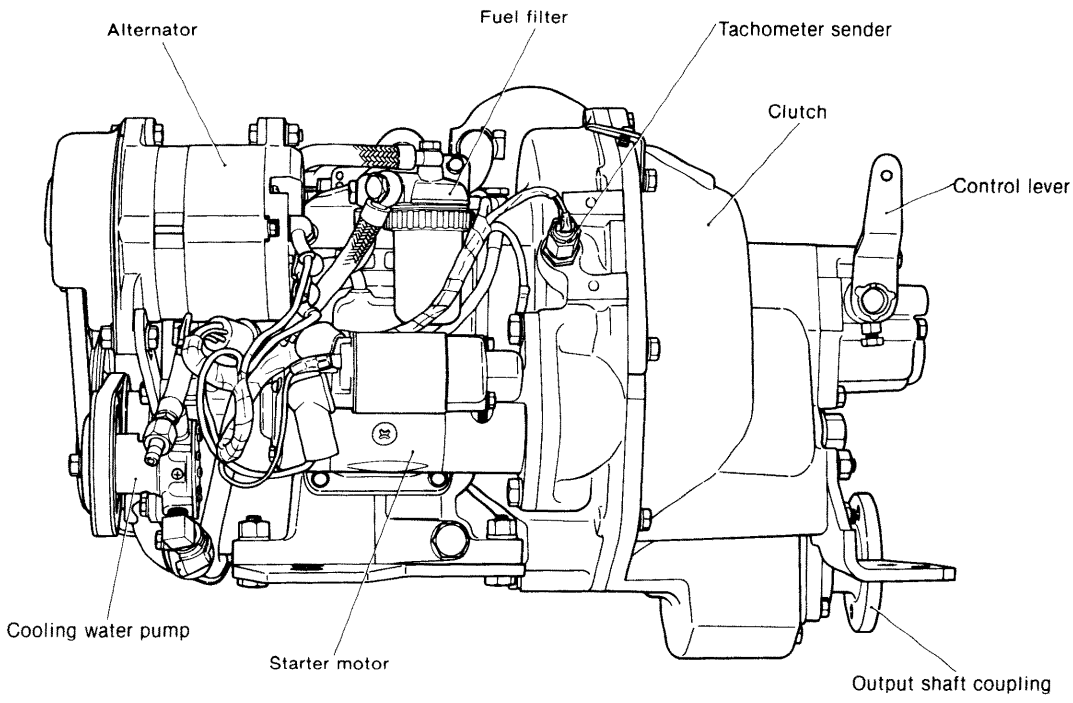
GENERAL

1. Exterior Views

1-1 Starboard



1-2 Port



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2. Specifications

Model			YSM8-R		YSM8-Y		YSM12-R		YSM12-Y	
Type			Horizontal 4-cycle water-cooled diesel engine							
Combustion chamber			Precombustion type							
Number of cylinders			1							
Bore × stroke		mm	75 × 75				85 × 90			
Displacement		ℓ	0.331				0.510			
Continuous rated output (DIN 6270A)	Output/crankshaft speed	HP/rpm	7/3200				10/3000			
	Mean piston speed	m/s	8.0				9.0			
	Propeller speed	rpm	1639	1093	1639	1093	1518	980	1518	980
One hour rating (DIN 6270B)	Output/crankshaft speed	HP/rpm	8/3200				12/3000			
	Mean piston speed	m/s	8.0				9.0			
	Propeller speed	rpm	1639	1093	1639	1093	1518	980	1518	980
Compression ratio			23:1				21:1			
Fuel injection timing		deg	bTDC 25							
Fuel injection pressure		kg/cm²	160 ±10							
Engine weight (dry)		kg	102		92		130		120	
Power takeoff position			Flywheel side							
Direction of rotation	Crankshaft		Counterclockwise (viewed from clutch side)							
	Propeller shaft		Counterclockwise (viewed from clutch side)							
Cooling system			Sea water forced cooling (rubber impeller water pump)							
Lubrication system			Closed forced lubrication							
Starting system			Electric with manual		Manual		Electric with manual		Manual	
Reduction gear system			Spur gear constant-mesh system							
Clutch			Wet single-disc mechanical type							
Reduction ratio	Ahead		1.95	2.93	1.95	2.93	1.98	3.06	1.98	3.06
	Astern		1.95	2.93	1.95	2.93	1.98	3.06	1.98	3.06
Engine size	Overall length	mm	608		598		638		628	
	Overall width	mm	602		576		673		647	
	Overall height	mm	436		544		485		591	
Lubricating oil capacity (rake angle 8°)	Crankcase Total/Effective	ℓ	1.9/0.8				3.0/1.0			
	Clutch Total/Effective	ℓ	0.7/0.2				0.7/0.2			
No-load engine speed	Maximum	rpm	3400		3400		3150		3150	
	Minimum	rpm	650		600		650		600	

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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
Intake and exhaust systems and valve mechanism	Cylinder head	Gasket separate valve guide
	Intake and exhaust valves	Poppet type, seat angle 90°
	Intake pipe	Intake inertia type steel pipe
	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 tapered
	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 type, steel plate 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 PFR type
	Fuel injection valve	Semi-throttle valve
	Fuel strainer	Paper element
Governor	Governor	Centrifugal all-speed mechanical type
Starting system	Electric	Pinion ring gear type starter motor
	Manual	Over-driven chain starting
Electrical system	Charger	Alternator (with built-in IC regulator)
Reduction reversing	Reduction gear	Spur gear constant-mesh system
Clutch system	Clutch	Wet single disc mechanical type

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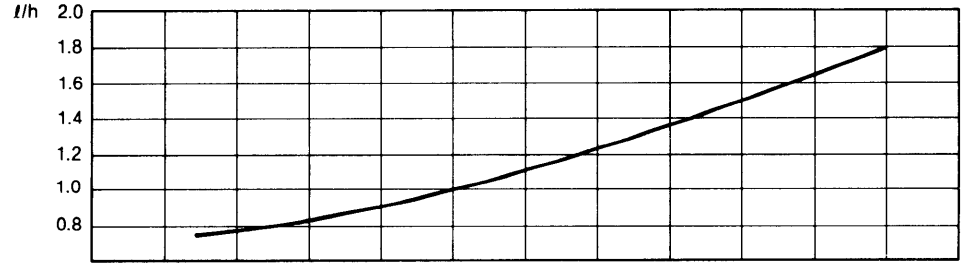
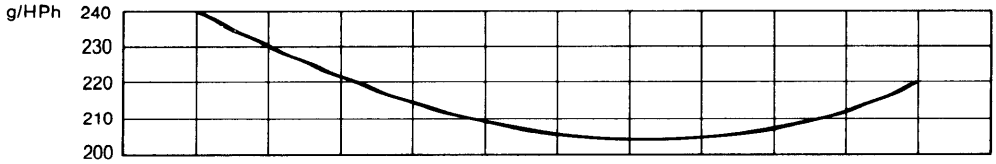
4. Performance Curves

1. YSM8-R, YSM8-Y

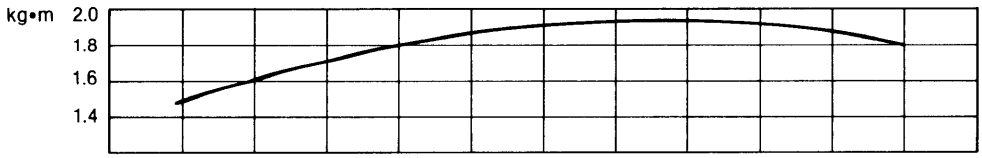
Fuel consumption at flywheel output



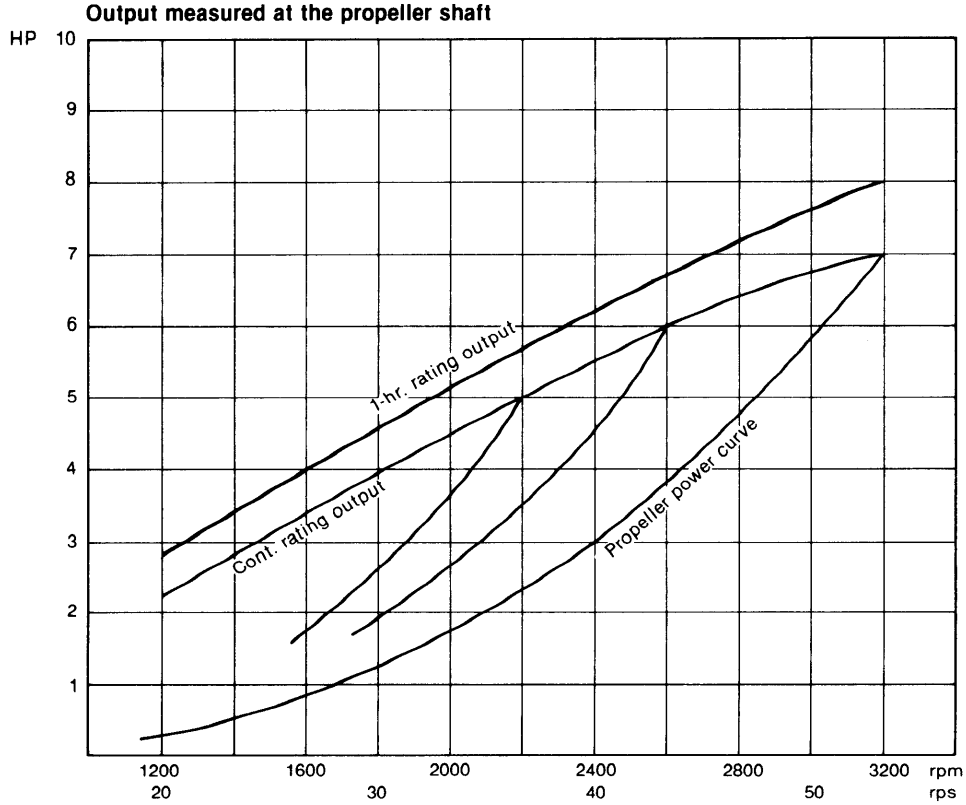
Specific fuel consumption at flywheel output



Torque measured at the flywheel



Output measured at the propeller shaft



The Engine Flywheel Output is Approx. 5% Higher.
Note: These curves show the average performance of respective engines in test operation at our plant.

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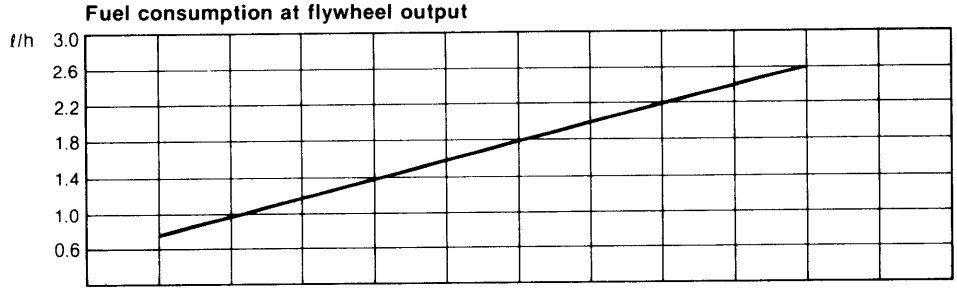
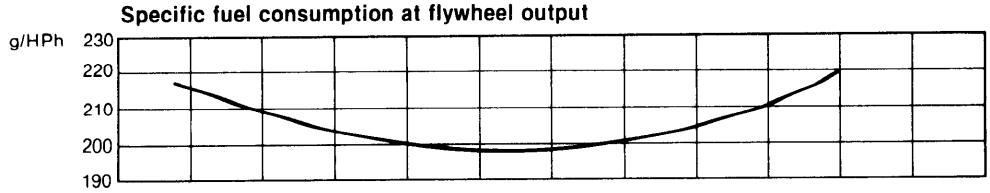
2. YSM12-R, YSM12-Y

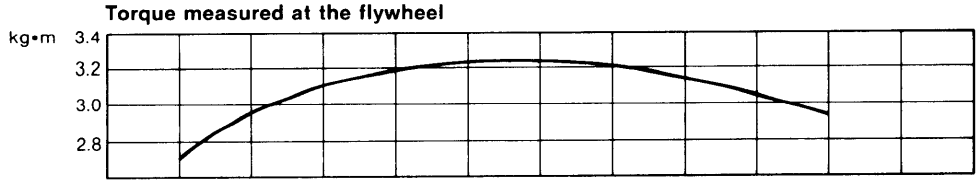
Fuel consumption at flywheel output



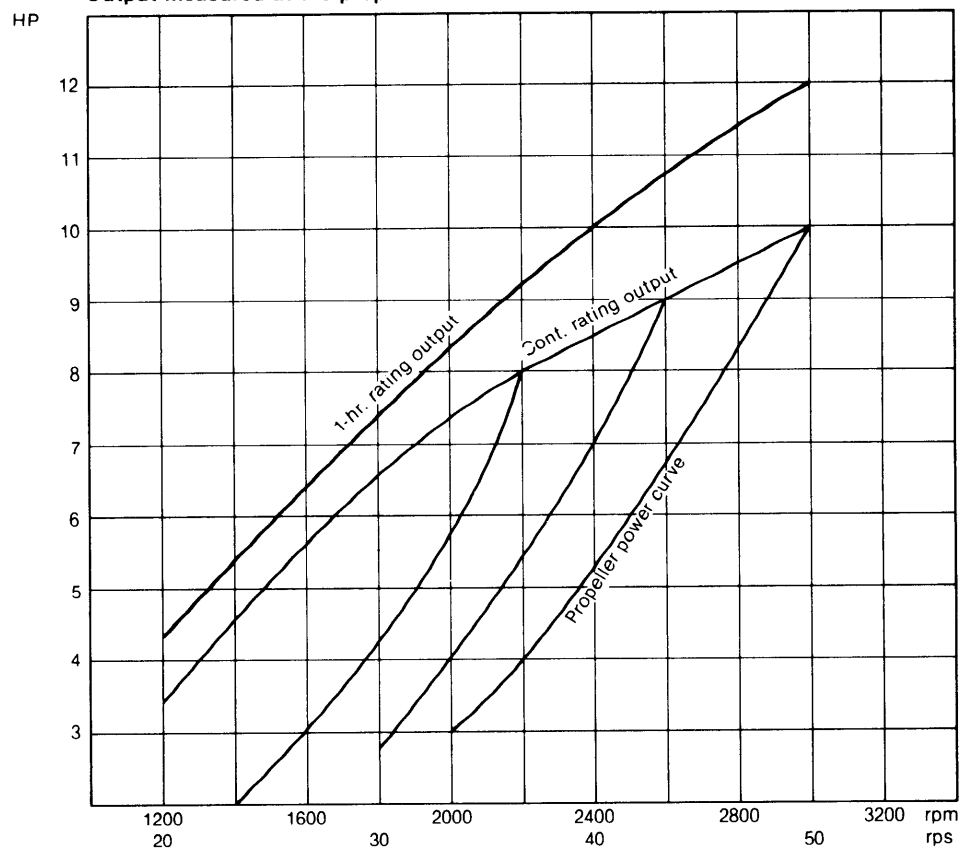
Specific fuel consumption at flywheel output



Torque measured at the flywheel



Output measured at the propeller shaft



The Engine Flywheel Output is Approx. 5% Higher.
Note: These curves show the average performance of respective engines in test operation at our plant.

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. Reduced weight and size
Reduction of the overall length and weight of the engine has been achieved by forging the clutch case and mounting of an aluminum alloy, and by adopting a new-type, small-size reduction and reversing gear, which is coupled direction to the flywheel. Moreover, since this is a horizontal type engine, its height has been significantly reduced, leaving much more space for cargo, etc.

4. Hundreds of hours of operation without an overhaul
The main moving parts, valve mechanism and combustion chamber have adopted designs and engineering materials which are ideally suited for high-speed engines. And since the cooling water is always kept at a constant high temperature by the thermostat, liner/ring wear is limited and the heat load around the combustion chamber is low, thereby ensuring lasting quality and increased durability.

5. Quiet operation
All the machine parts which produce reciprocating motions and are the source of vibrations in the engine, have been reduced in weight and perfectly balanced, cutting vibrations to a minimum. Also, because of the adoption of an intake silencer and mixing exhaust, noise has been greatly reduced without sacrificing engine speed.

6. Easy handling and simplified operation
(1) The slope of the breather has been increased to withstand violent rollings, even up to 30°, thereby eliminating lubricating oil worries.
(2) A bracket has been mounted on the clutch so that speed-clutch control can be performed with Morse remote control device.
(3) By taking account of cabin electric power consumption, the capacity of the alternator has been increased.
(4) Because of the adoption of alarm lamps which light up when there is a rise in the temperature of the cooling water or a drop in the pressure of the lubricating oil, engine troubles are prevented.

7. Easy installation
(1) The four-point support type engine installing leg has greatly facilitated engine installation.
(2) Since the instrument panel can be installed separately it can be placed anywhere on board for easy monitoring.
(3) Rubber hoses are employed for the easy installation of on-board piping.
(4) Electrical wiring can be connected quickly and easily with connectors.

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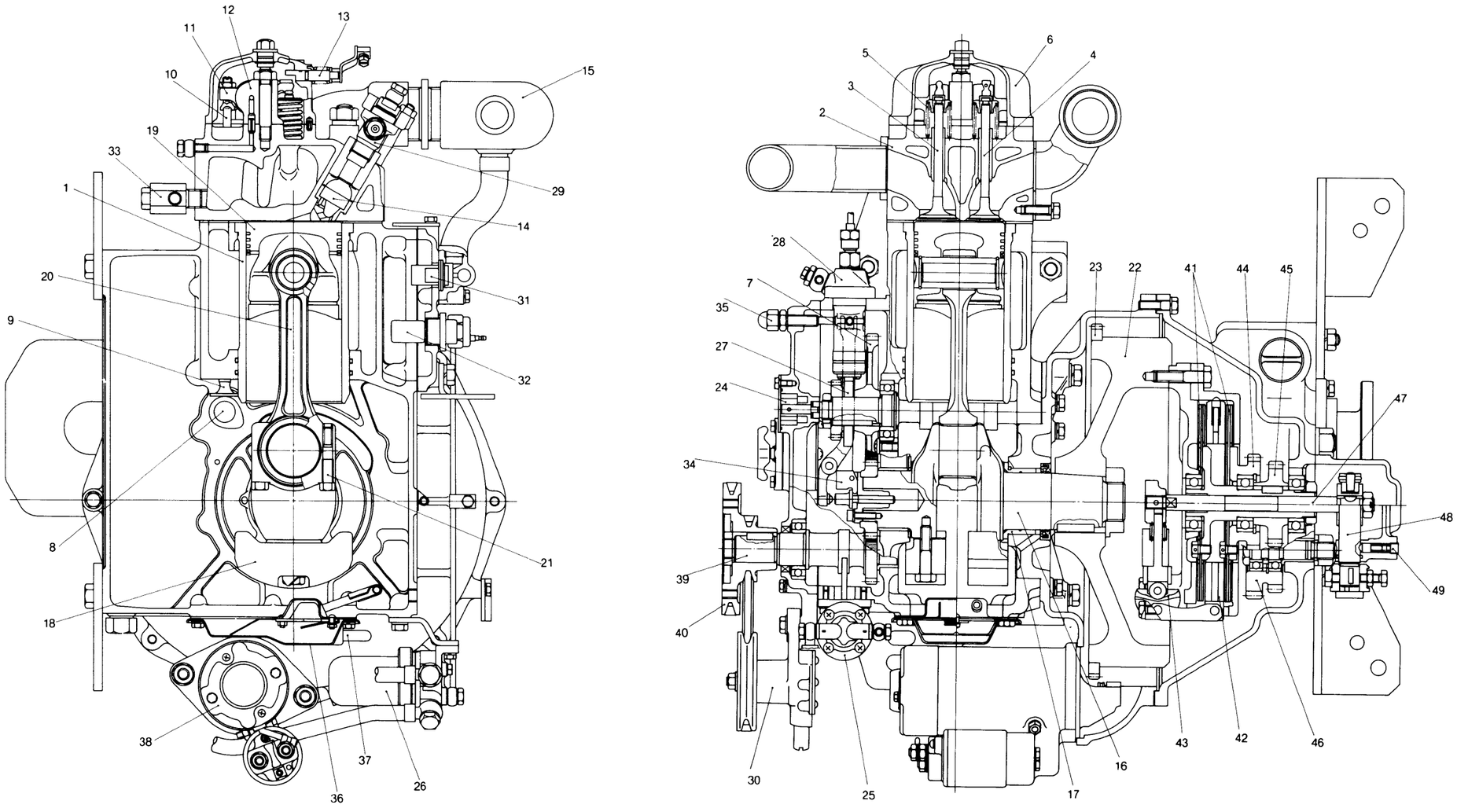
6. Engine Cross-section



1 Cylinder liner
2 Cylinder head
3 Intake valve
4 Exhaust valve
5 Valve spring
6 Valve rocker arm chamber
7 Camshaft gear
8 Camshaft
9 Tappet
10 Push rod
11 Valve rocker arm
12 Valve rocker arm support
13 Decompression shaft
14 Precombustion chamber
15 Mixing elbow
16 Crankshaft
17 Main bearing
18 Balance weight
19 Piston
20 Connecting rod
21 Connecting rod bolt
22 Flywheel
23 Ring gear
24 Lubricating oil pump
25 Fuel feed pump
26 Fuel filter
27 Fuel cam
28 Fuel pump
29 Fuel injection nozzle
30 Cooling water pump
31 Thermostat
32 Anticorrosion zinc
33 Cooling water drain cock
34 Governor weight
35 Fuel injection limiter
36 Cylinder rear cover
37 Breather pipe
38 Starter motor
39 P.T.O. shaft
40 P.T.O. shaft pulley
41 Friction disc
42 Friction plate
43 V-lever
44 Reverse gear
45 Forward gear
46 Idle gear
47 Shifting shaft
48 Fork shaft
49 Neutral point set claw

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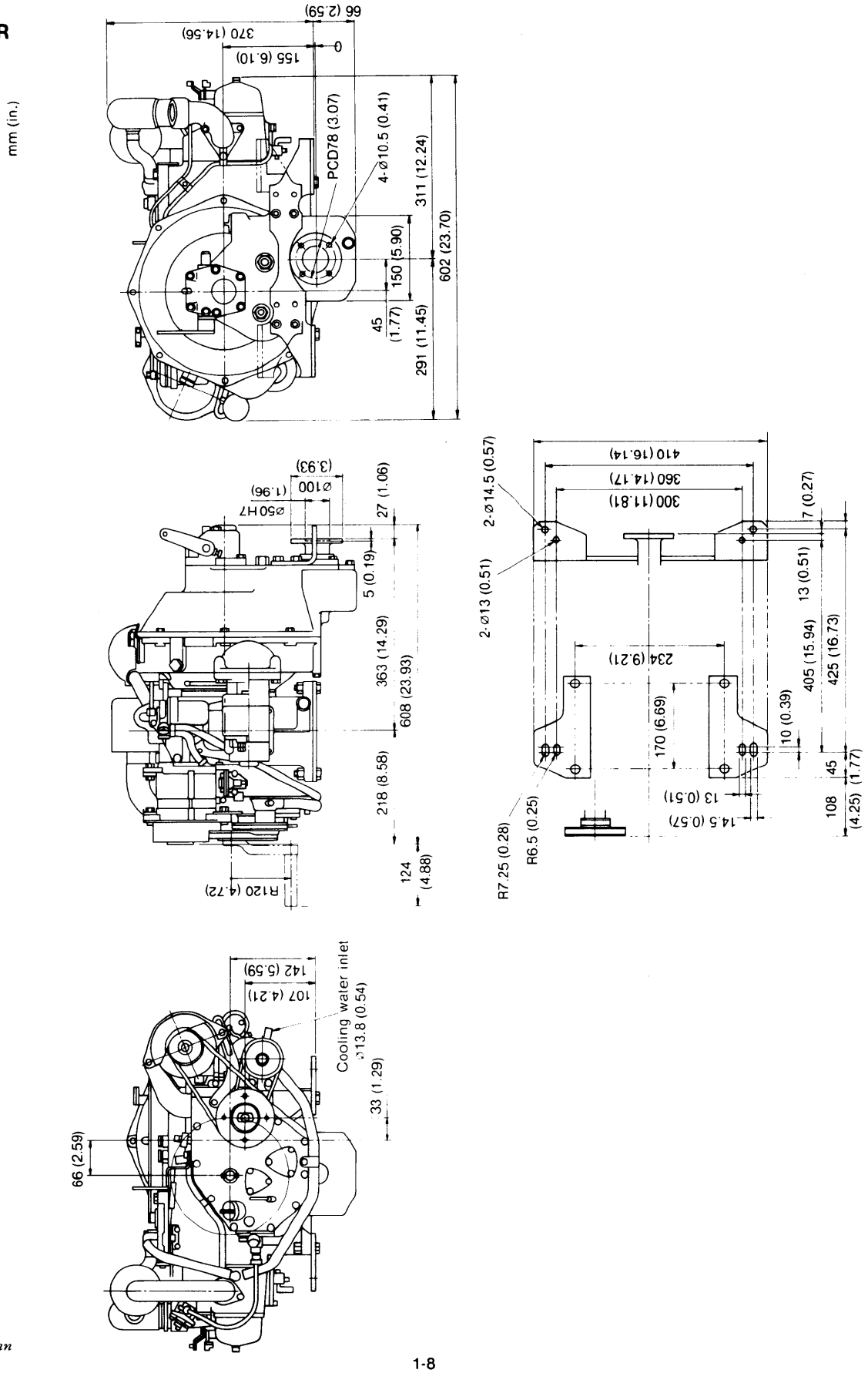
7. Exterior Views

7-1 YSM8-R

mm (in.)



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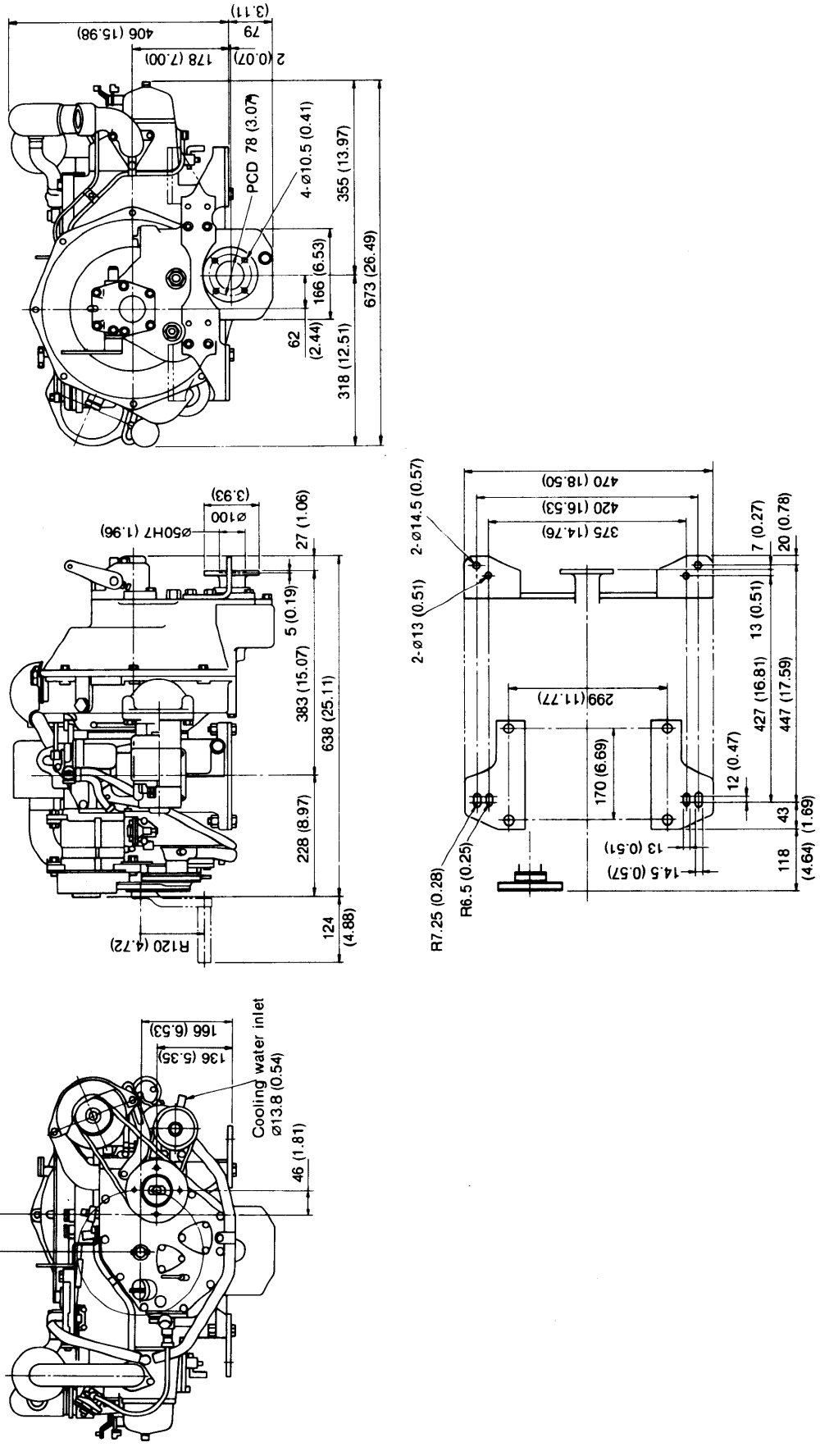
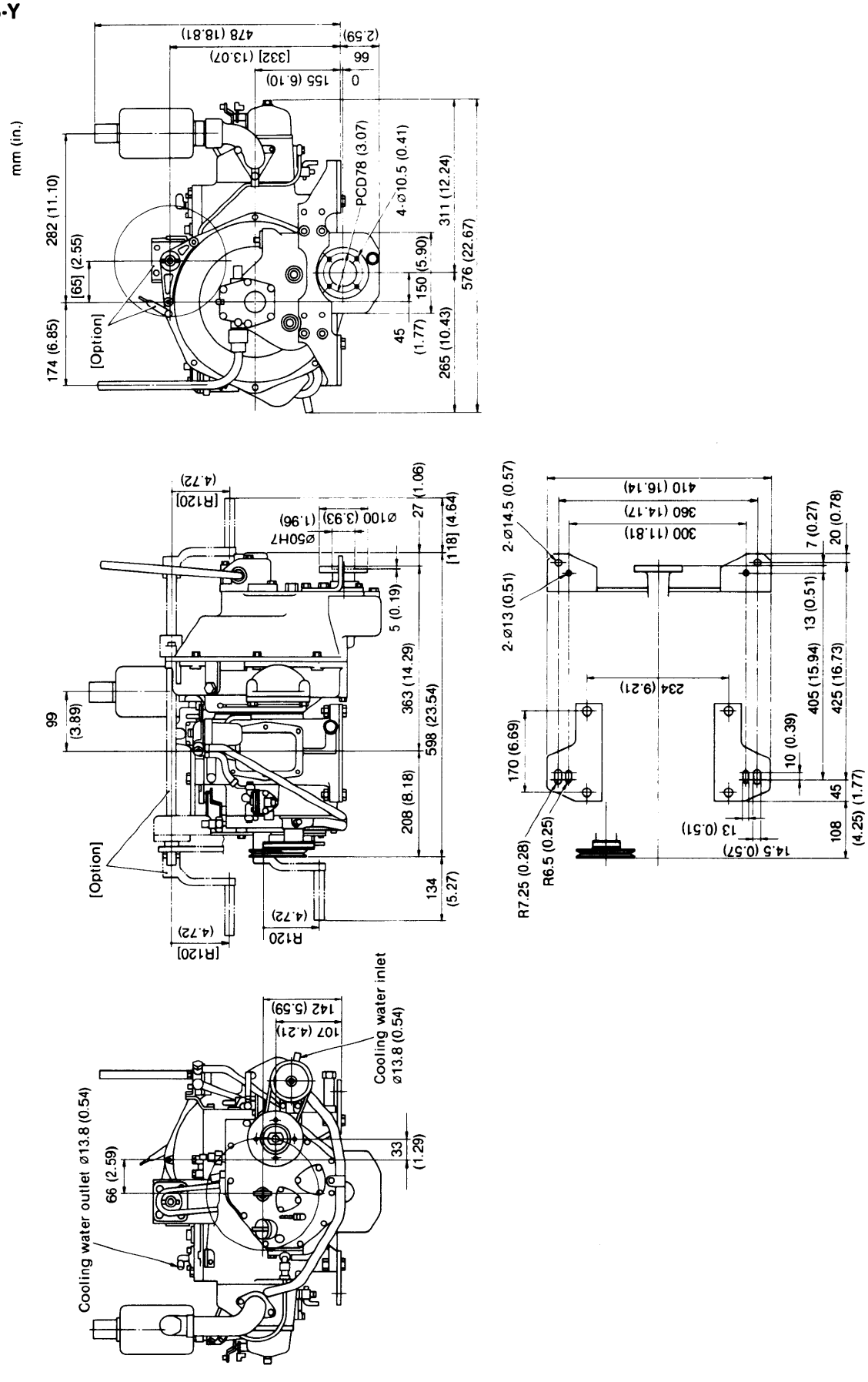
7-2 YSM12-R

mm (in.)



7-3 YSM8-Y



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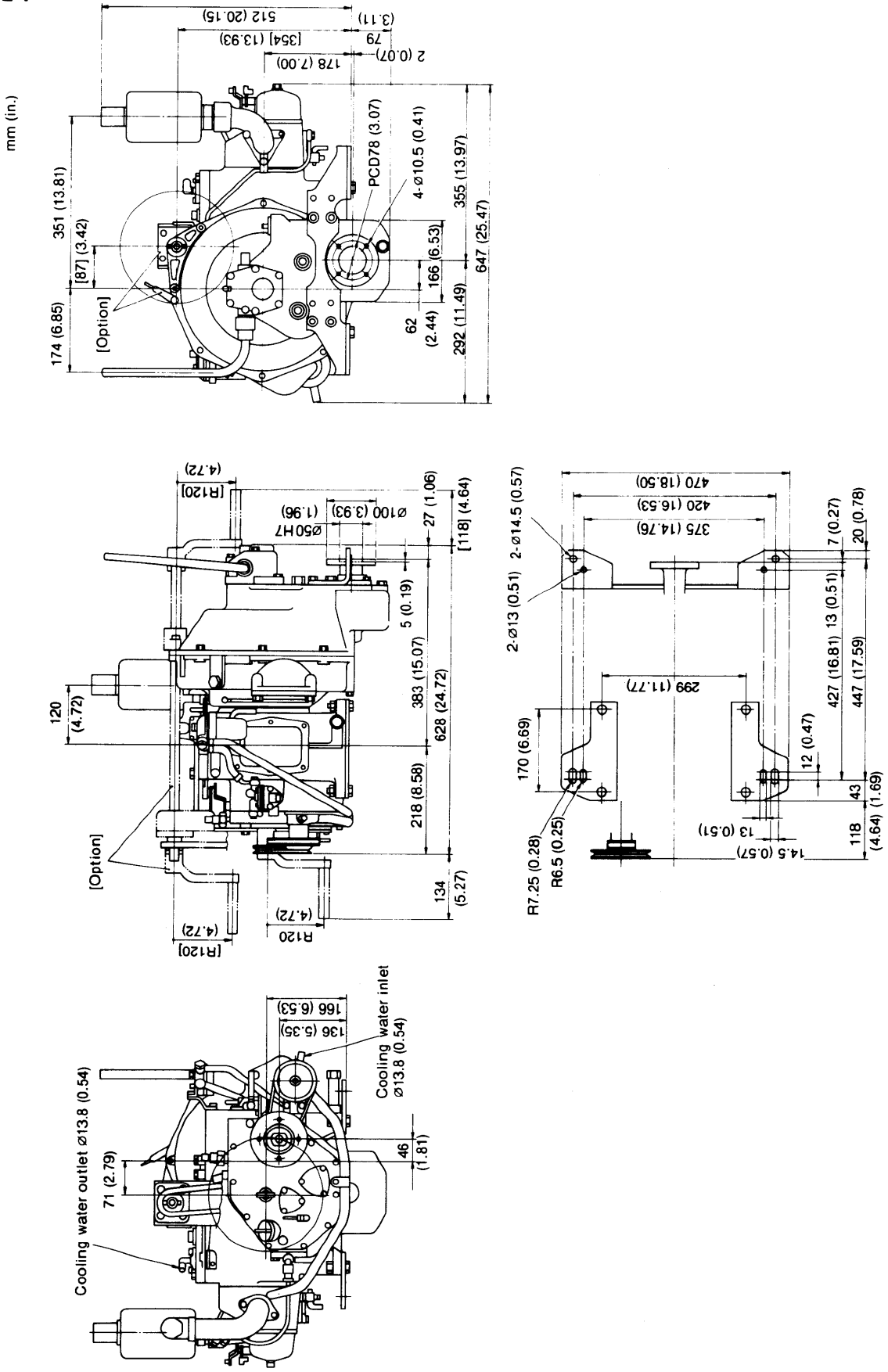
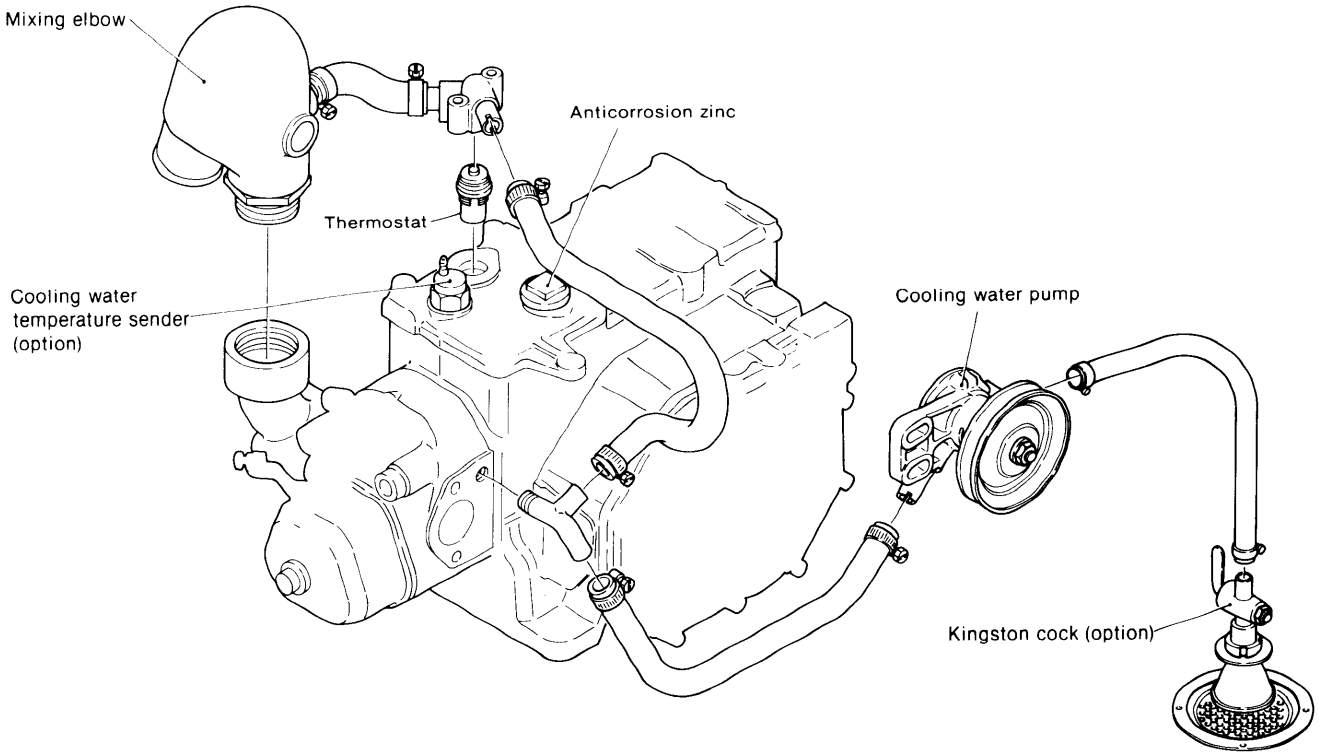
7-4 YSM12-Y


mm (in.)
512 (20.15)
(3.11)
[354] (13.93)
79
178 (7.00)
2 (0.07)
PCD78 (3.07)
4-ø10.5 (0.41)
355 (13.97)
647 (25.47)
351 (13.81)
[87] (3.42)
166 (6.53)
174 (6.85)
[Option]
62
(2.44)
292 (11.49)
[R120]
(4.72)
ø100 (3.93) (1.96)
ø50H7
27 (1.06)
[118] (4.64)
5 (0.19)
383 (15.07)
628 (24.72)
120
(4.72)
218 (8.58)
[Option]
134
(5.27)
R120
(4.72)
[R120]
(4.72)
470 (18.50)
420 (16.53)
375 (14.76)
2-ø14.5 (0.57)
2-ø13 (0.51)
7 (0.27)
20 (0.78)
13 (0.51)
299 (11.77)
427 (16.81)
447 (17.59)
170 (6.69)
12 (0.47)
43
(1.69)
13 (0.51)
118
(4.64)
14.5 (0.57)
R7.25 (0.28)
R6.5 (0.25)
166 (6.53)
136 (5.35)
Cooling water inlet
ø13.8 (0.54)
46
(1.81)
71 (2.79)
Cooling water outlet ø13.8 (0.54)

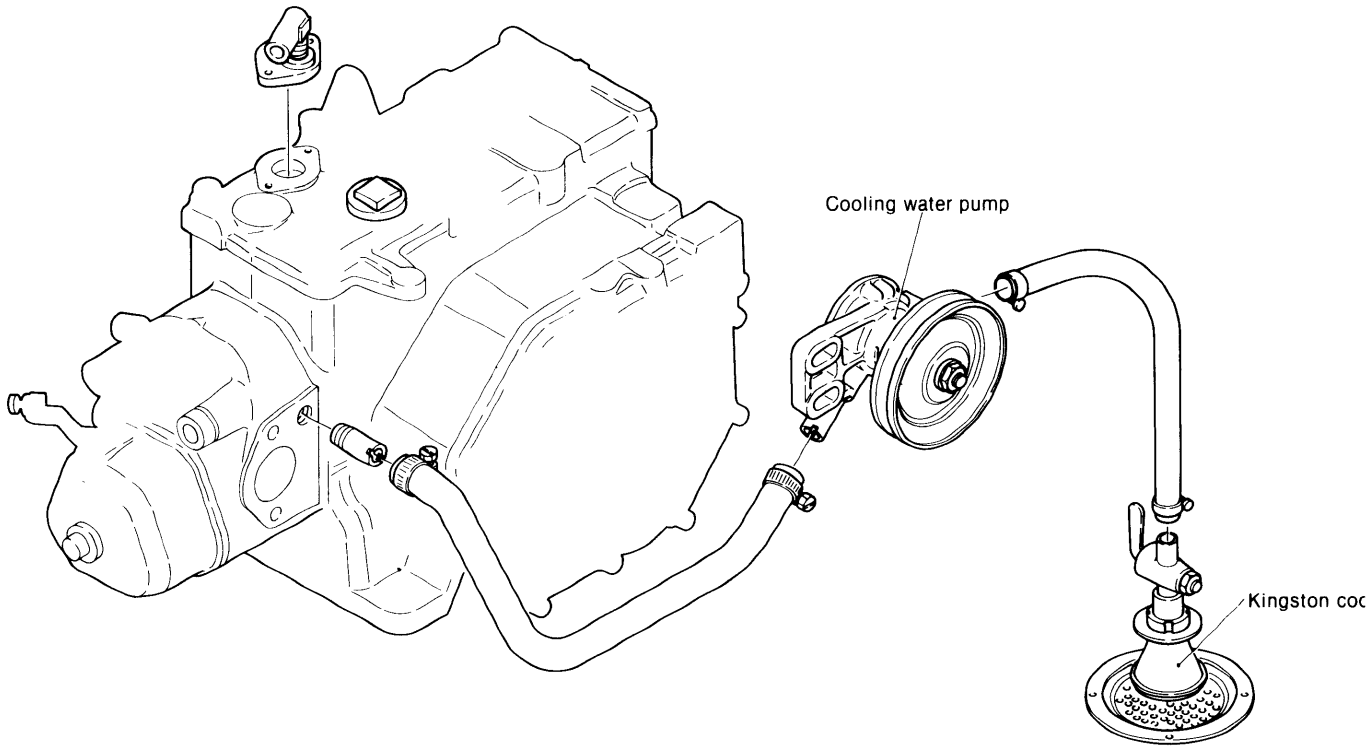
8. System Diagrams

8-1 Cooling system

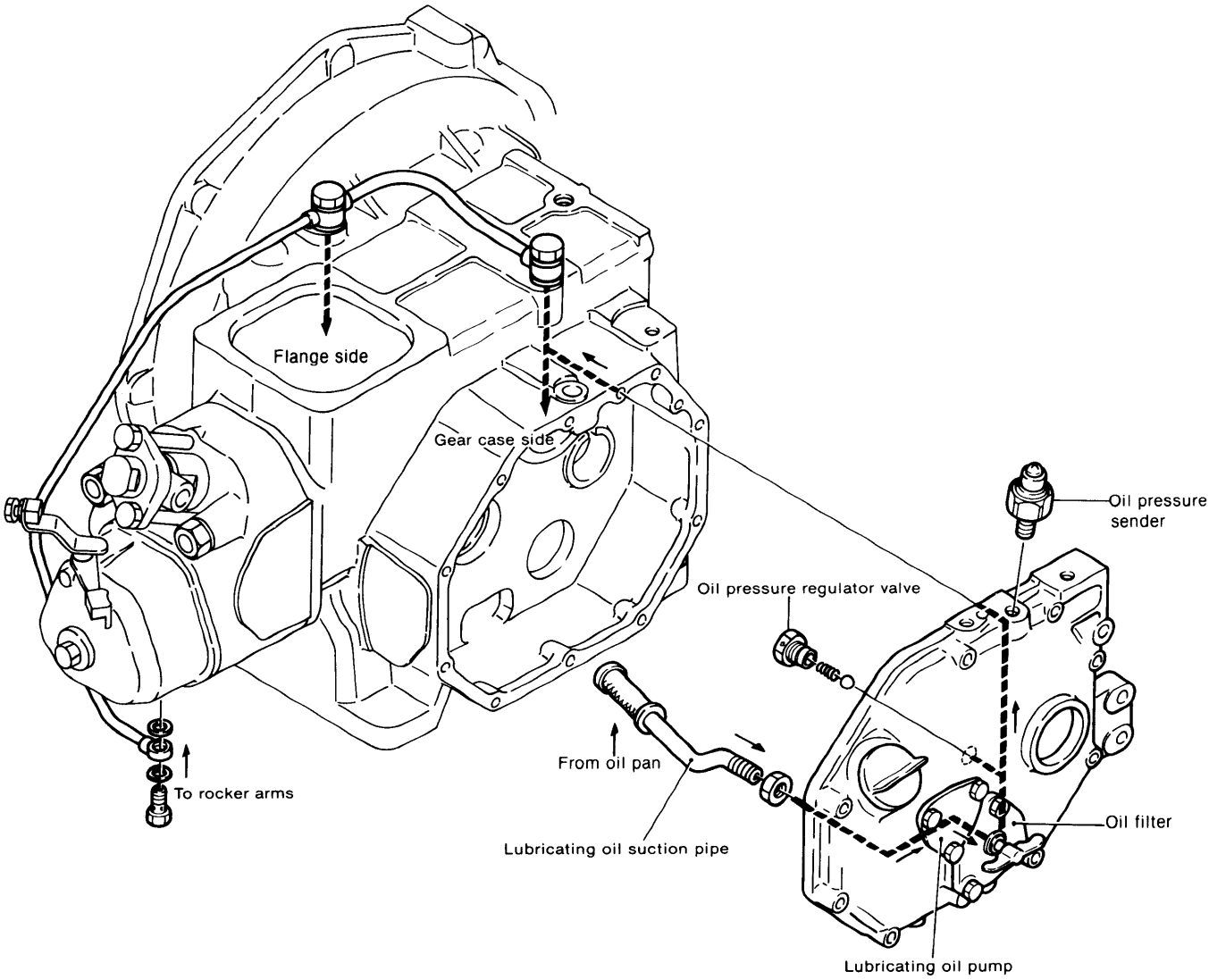
8-1.1 YSM8-R, YSM12-R



8-1.2 YSM8-Y, YSM12-Y



8-2 Lubrication system



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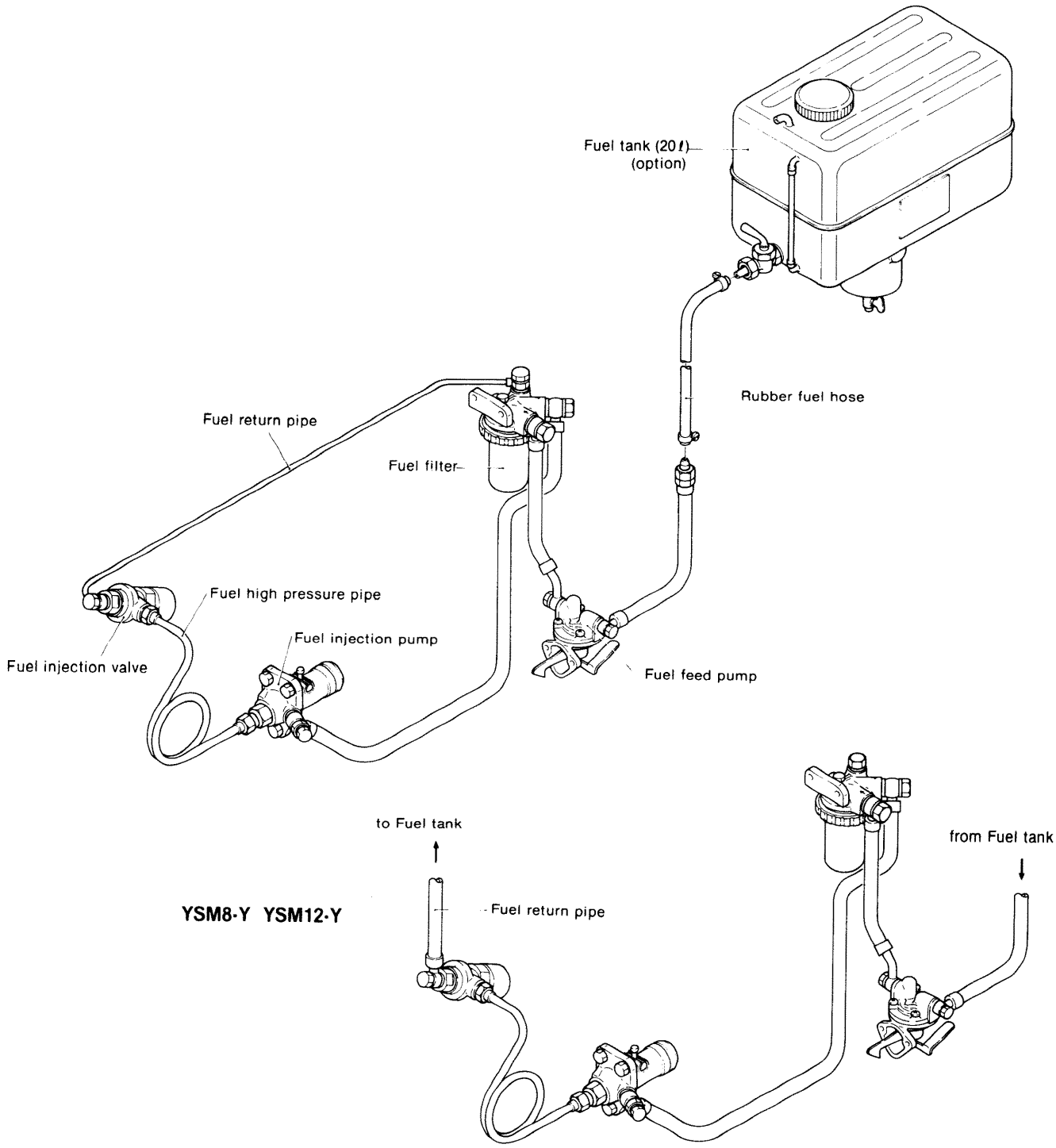
8-3 Fuel system



8-4 Electrical system