

CHAPTER 5

INTAKE AND EXHAUST SYSTEM

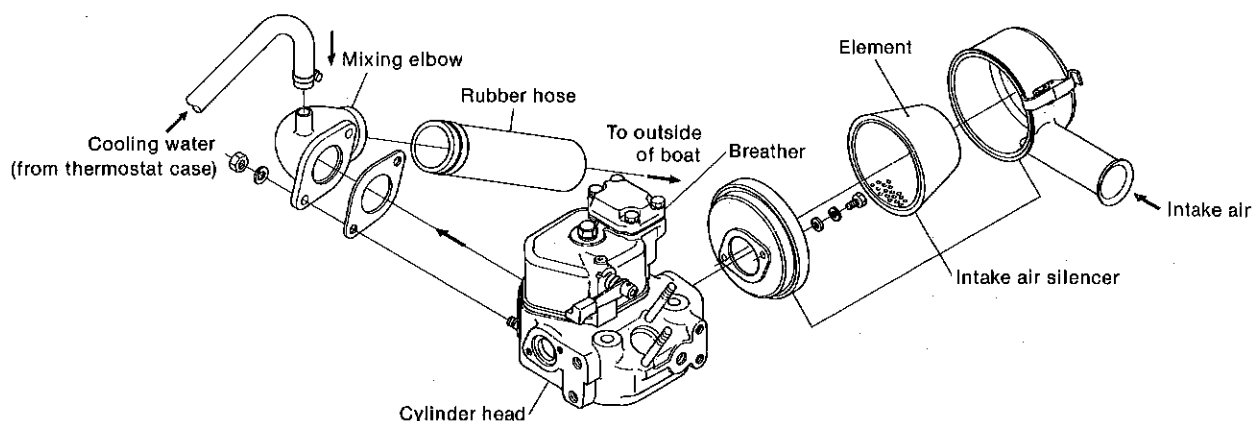
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1. Intake and Exhaust System

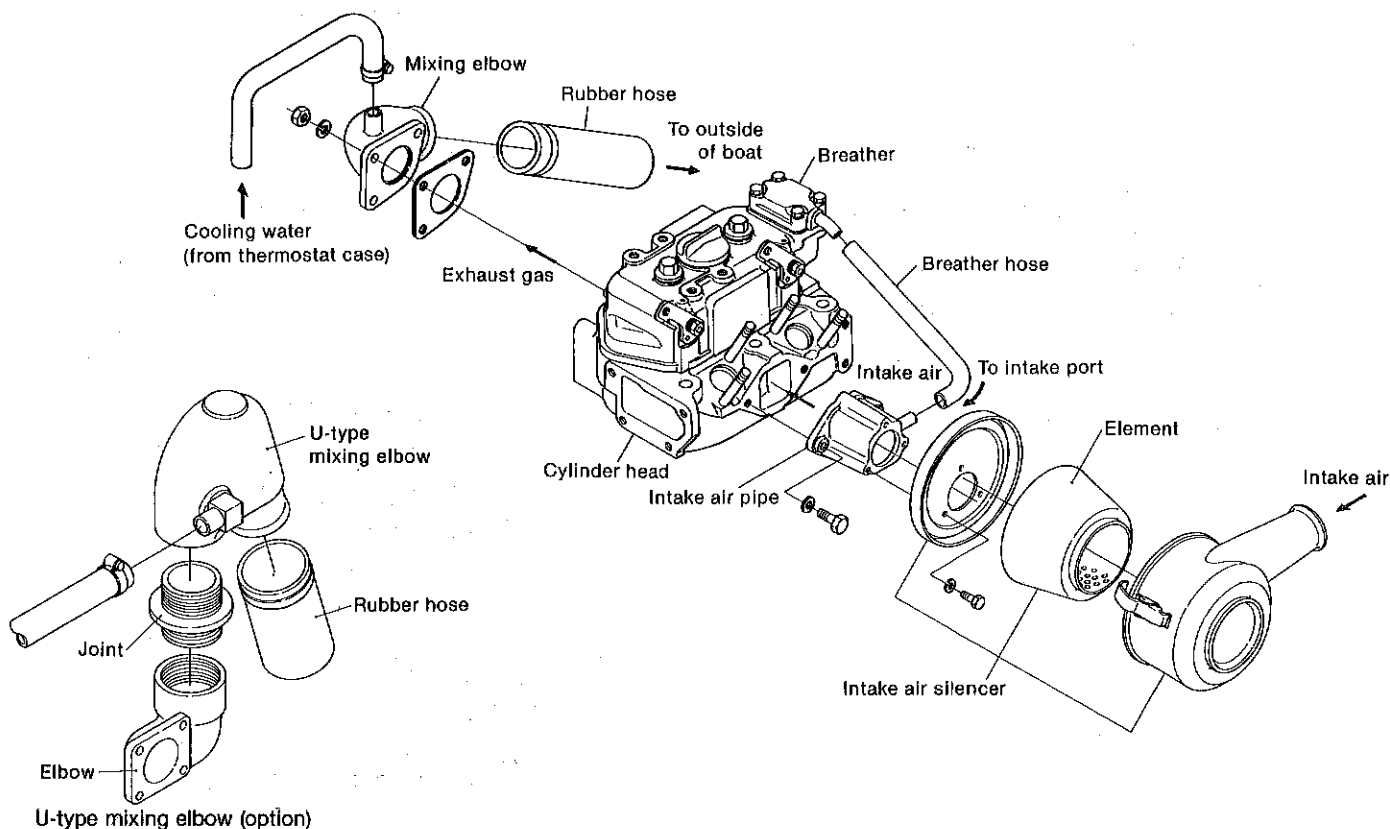
The intake air silencer is installed at the intake side for the purpose of reducing noise and cleaning the air. The exhaust system for model 1GM10(C) and 2GM20(F)(C) engines is so constructed that the mixing elbow is fitted directly to the cylinder head. The cooling water passes into this mixing elbow and is mixed with exhaust gas at the pipe outlet.

A water-cooled exhaust manifold is installed on engine models 3GM30(F)(C) and 3HM35(F)(C), and the mixing elbow is fitted to the outlet port of the exhaust manifold. The cooling water, after passing through the water jacket and cooling the exhaust gas, is mixed with the exhaust gas in the mixing elbow.

1-1 Intake and exhaust system of model 1GM10(C).

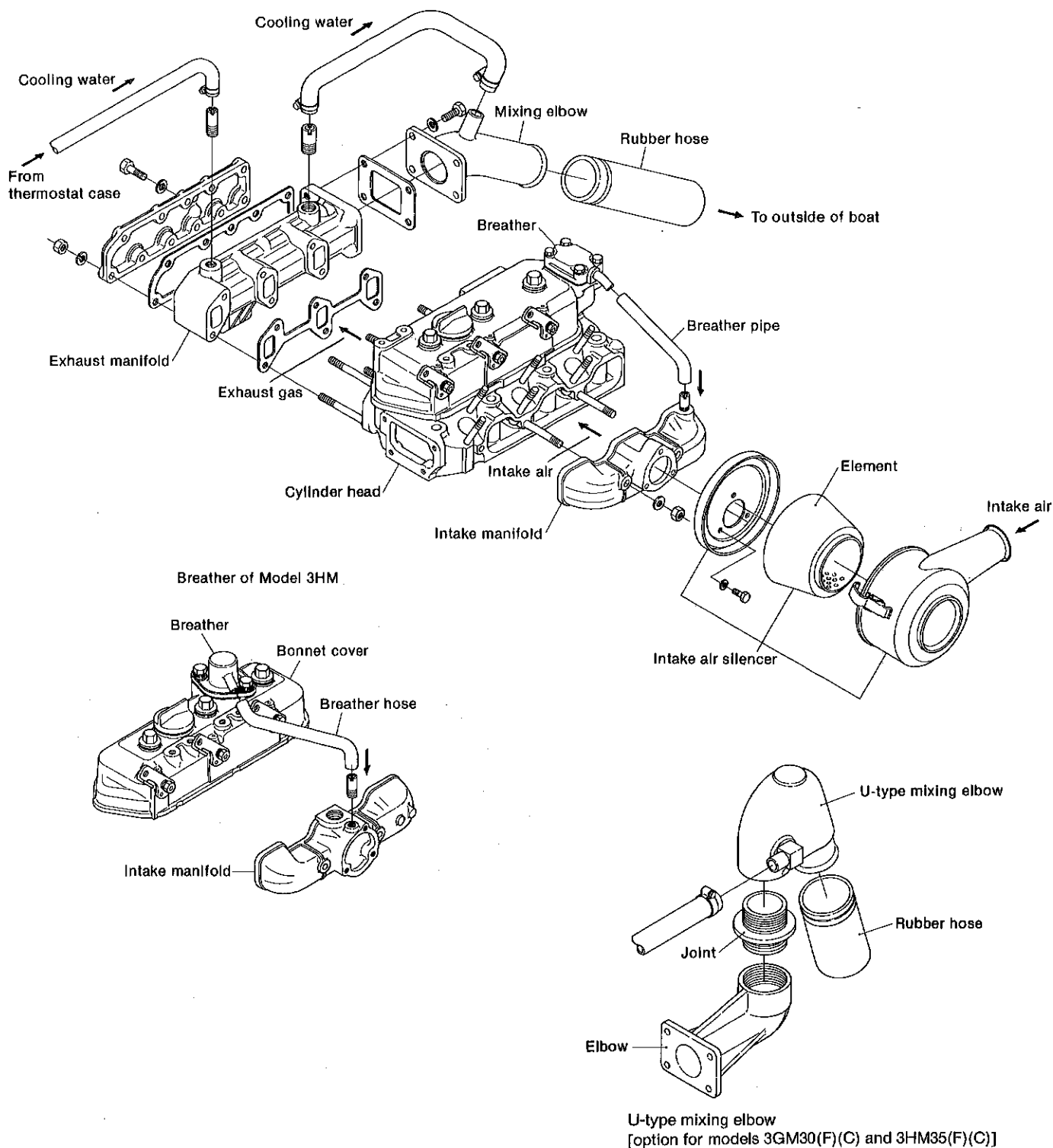


1-2 Intake and exhaust system of model 2GM20(F)(C)



1-3 Intake and exhaust system of models 3GM30(F)(C) and 3HM35(F)(C)

The intake and exhaust system for models 3GM30(F)(C) and 3HM35(F)(C) is the same except for the construction of the breather.



2. Intake Silencer

2-1 Construction

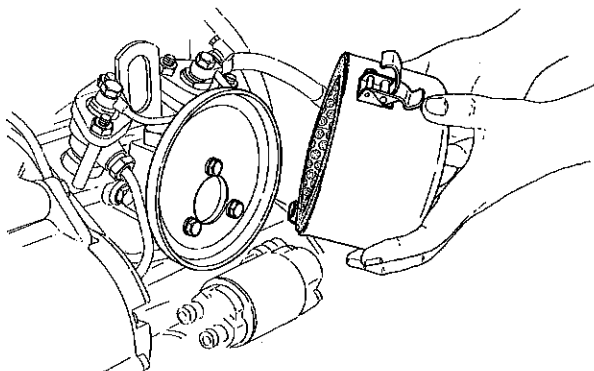
A round polyurethane sound absorbing type intake silencer is employed to silence the intake air sucked into the cylinder head from the intake port.

Besides providing a silencing effect, the silencer also acts as an air cleaner.

	1GM10(C)	2GM20(F)(C) 3GM30(F)(C)	3HM35(F)(C)
Rated air volume (average)	150 #/min	1560 #/min	2800 #/min
Draft resistance	150 mmAq	100 mmAq	150 mmAq

2-2 Inspection of the intake silencer

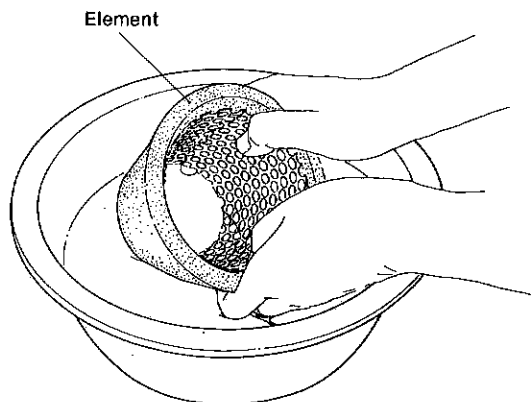
Occasionally, disassemble the intake silencer, remove the polyurethane element and inspect it. Because the element filters the air, if it is used over a long period of time it will become clogged and this decreases the amount of intake air, and may also be a cause of decreased output.



2-3 Washing the intake silencer element

Wash the air intake silencer element with a neutral detergent.

Washing period	Every 250 hours
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3. Exhaust System

The mixing elbow of models 1GM10(C) and 2GM20(F)(C) is fitted directly to the outlet port of the cylinder head instead of being fitted to the exhaust manifold.

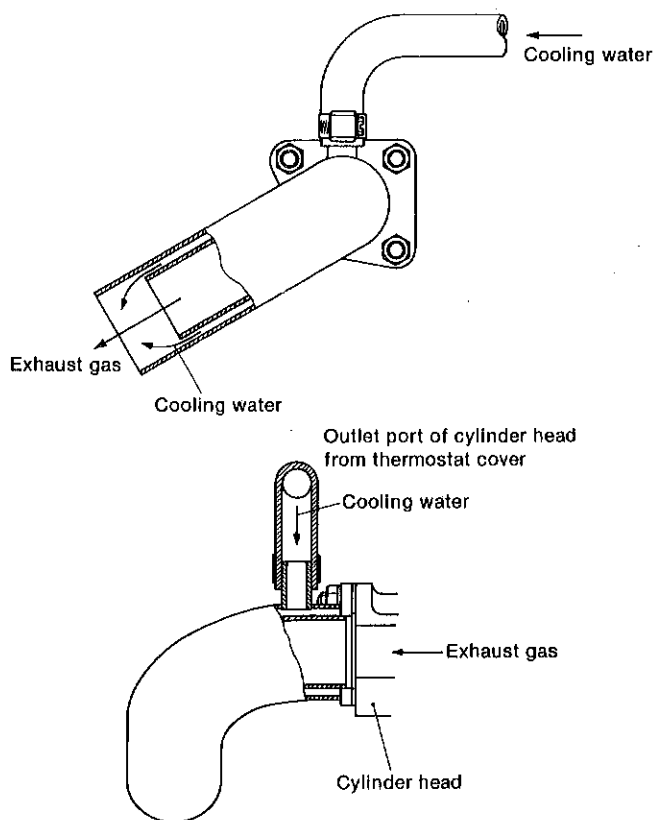
However, on models 3GM30(F)(C) and 3HM35(F)(C), an exhaust manifold is also installed and the mixing elbow is fitted to the manifold outlet port.

3-1 Exhaust manifold and mixing elbow

The high temperature, high pressure exhaust gas intermittently emitted from the cylinders at the speed of sound enters the exhaust manifold where it is muffled by expansion and water cooling. It is then mixed with the cooling water at the mixing elbow to lower its temperature and muffle it further, and is discharged.

A water-cooled exhaust manifold is employed for a high muffling effect.

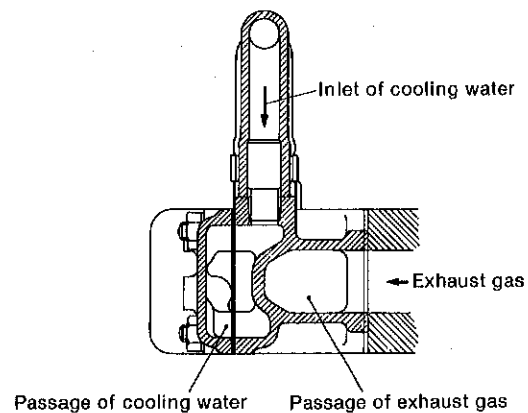
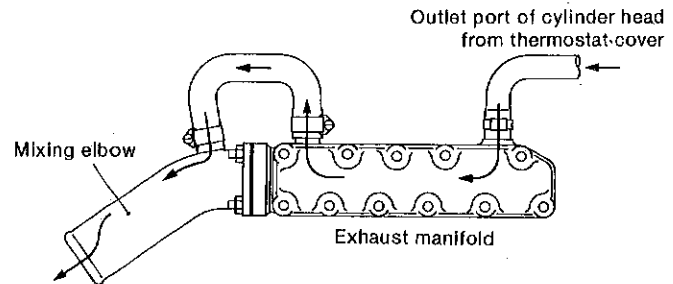
3-1.1 For models 1GM10(C) and 2GM20(F)(C)



As shown in the figure, the construction for models 1GM10(C) and 2GM20(F)(C) is such that there is no exhaust manifold and the mixing elbow is fitted to the exhaust gas outlet port. A double construction technique has been adopted for the mixing elbow; as the exhaust gas passes through it the cooling water passes round the outside to cool the exhaust gas and then the gas and water mix close to the outlet port.

3-1.2 For models 3GM30(F)(C) and 3HM35(F)(C)

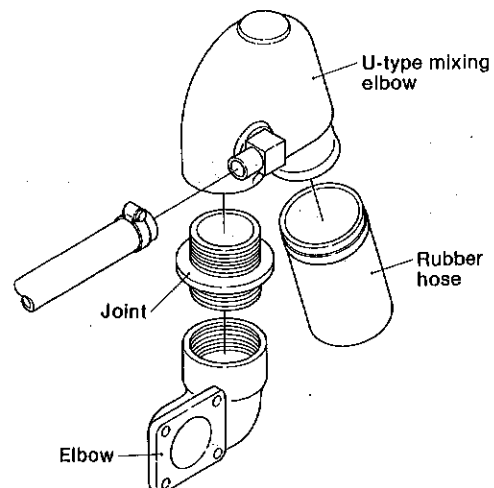
Both exhaust manifold and mixing elbow are installed.



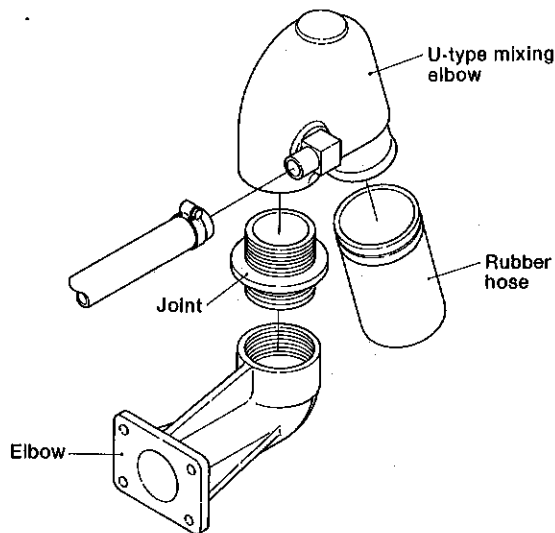
The construction of the exhaust manifold is shown in the figure, and a water chamber is formed between the exhaust manifold and the cover to cool the exhaust gas. The construction of the mixing elbow is the same for models 1GM10(C) and 2GM20(F)(C).

3-1.3 U type mixing elbow (optional)

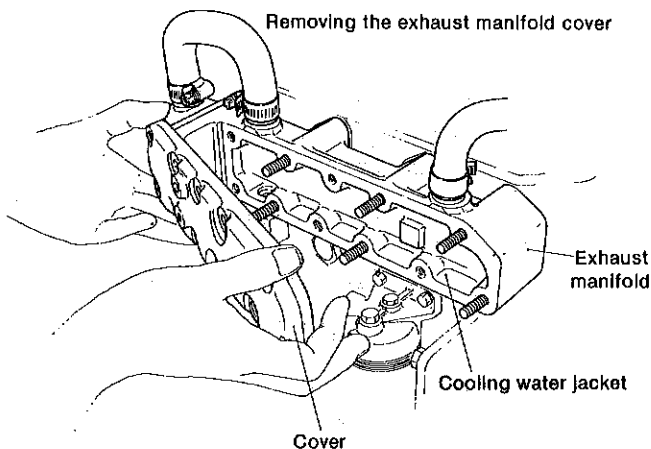
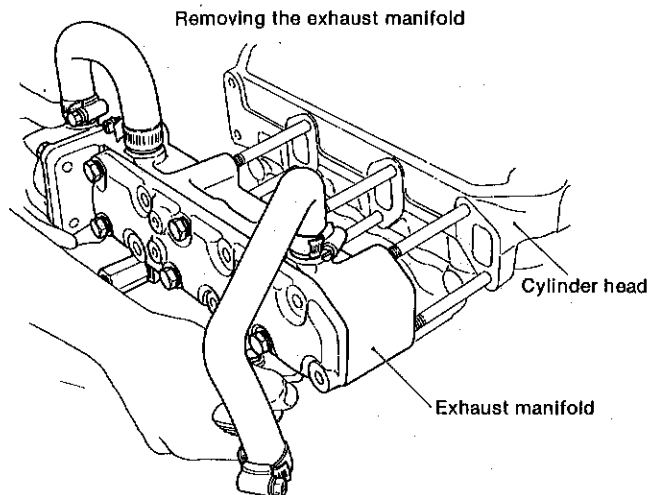
For model 2GM20(F)(C)



For models 3GM30(F)(C) and 3HM35(F)(C)

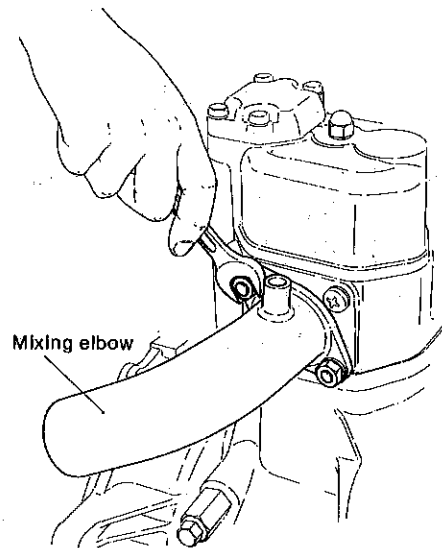


3-2 Exhaust manifold inspection



- (1) Gasket packing
Inspect the gasket packing and replace if damaged.
- (2) Carbon build-up in the exhaust passage
Remove the exhaust manifold elbow and cover and check carbon build-up in the exhaust passage. Remove any carbon in the passage. If carbon build-up becomes heavy, the exhaust pressure will rise, causing overheating of the cylinders and difficult starting.
- (3) Corrosion and scale at the cooling water jacket
Inspect the water passage for the build-up of scale and foreign matter and remove if found. Also check for corrosion of the anticorrosion zinc installed on the cylinder head and the cylinder head water jacket and replace if corrosion is severe. Also, replace the cylinder head if it has been cracked by local overheating.
- (4) Drain cock
Inspect the drain cock for clogging and check its action. Repair or replace if faulty.

3-3 Mixing elbow inspection



Check for carbon build-up and for corrosion inside the pipe, and repair or replace the pipe if faulty. Also, inspect the mixing elbow mounting threads for cracking and corrosion.

This section is affected by exhaust gas and vibration.

NOTE: The part where high temperature gas and cooling water are mixed is especially likely to corrode, so it must be inspected with special care.

4. Breather

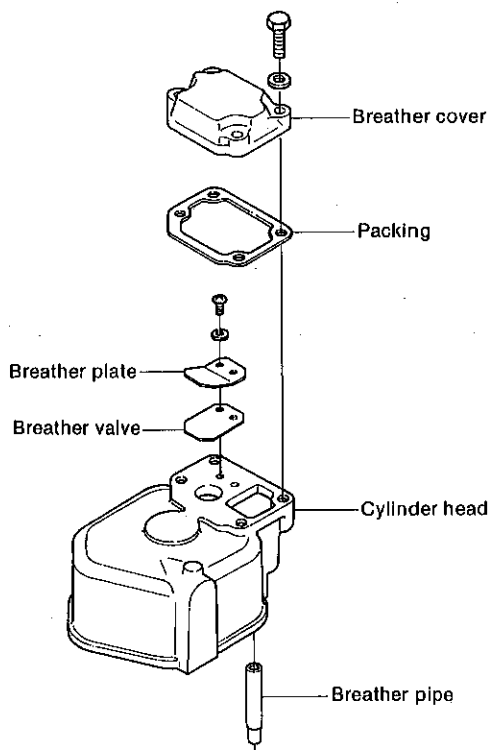
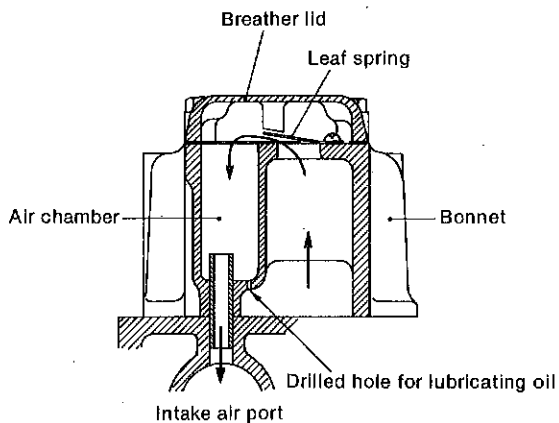
4-1 Construction of breather

The same construction is adopted for each model of engine in that the breather device is fitted to the bonnet cover, and the vapor in the crank case is sucked into the intake port or intake manifold through the tappet hole and breather. However, the construction of the breather itself differs from model to model.

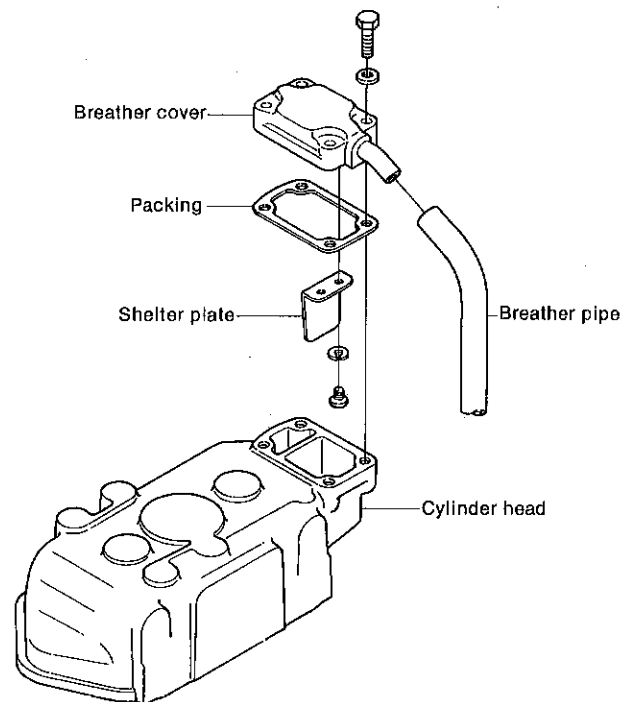
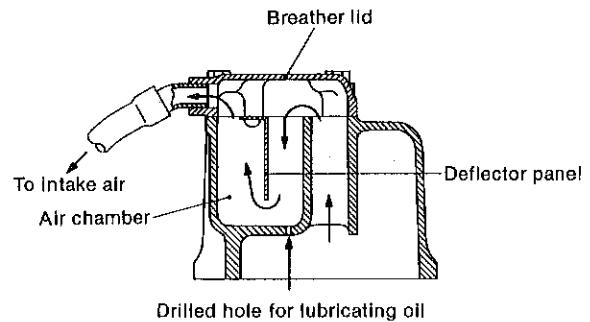
NOTE: If trouble is experienced with the breather, take care that the engine does not jolt when running as the lubricating oil may enter from the inlet port and mix with the fuel oil.

4-1.1 Breather for model 1GM10(C)

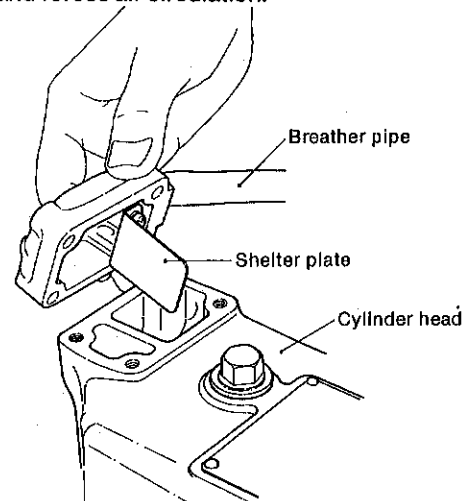
The vapor which lifts up the leaf spring fitted at the top of the bonnet then enters the other air chamber, and is sucked through the intake port.



4-1.2 Breather for models 2GM20(F)(C) and 3GM30(F)(C)



The deflector panel fitted to the breather lid enters the air chamber, and forces air circulation.



4-1.3 Breather for model 3HM35(F)(C)

