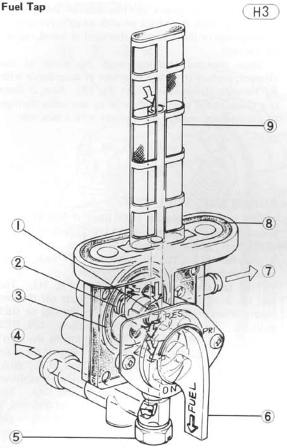
Fuel Tap



1. O Ring
2. Spring
3. Diaphragm
4. Fuel
5. Drain Plug
6. Tap Lever
7. Vacuum
8. O Ring
9. Filter

The automatic valve in the fuel tap operates as follows: When the engine is running, negative pressure (vacuum) is created at the carburetor due to engine intake. This engine intake vacuum is transmitted to the diaphragm vacuum chamber in the fuel tap through the vacuum hose and the check valve. The vacuum pulls the diaphragm ③ against its spring pressure, and the **O** ring ① on the diaphragm assembly ③ is pulled out of its seat, permitting fuel to flow between the **O** ring and seat. When the engine stops and vacuum is lost, air enters the diaphragm vacuum chamber through the vacuum hose, bringing chamber pressure back up to atmospheric and allowing the diaphragm spring ② to push the diaphragm back into place and hold the **O** ring against the seat.

The check valve in the diaphragm cover keeps the pressure in the diaphragm vacuum chamber negative in spite of the pulsation of the intake vacuum while the engine is running so that fuel flows smoothly.

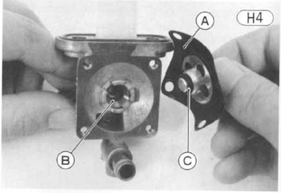
Inspection and cleaning

If fuel leaks from the tank cap or from around the fuel tap, the cap gasket or tap **O** ring may be damaged. Visually inspect these parts, and replace them if necessary.

Examine the air vent in the tank cap to see if it is obstructed. Use compressed air to clear an obstructed vent.

Any water in the fuel tank and the carburetors can be drained through the drain plugs (Pg. 21). If water can not be drained completely by removing the drain plugs, remove the fuel tap (Pg. 44), and flush out the tank with a high flash-point solvent. For thorough cleaning of the carburetors, remove and disassemble the carburetors (Pg. 45).

If there is any doubt about the condition of the fuel tap, remove and disassemble the fuel tap (Pg. 44), and inspect the parts. Especially examine the diaphragm assembly. Make sure the **O** ring and its seat are clean and undamaged; if the **O** ring is prevented from seating properly or if it is damaged, fuel flow will not stop when the engine is stopped, and may overflow from the carburetors. Visually inspect the diaphragm. If there is any tear or other damage, the diaphragm assembly should be replaced.



A. Diaphragm **B. "O" Ring Seat** **C. "O" Ring**

Clean the air and fuel passages by lightly applying compressed air to the passage openings.

CAUTION **Do not use wire for cleaning as this could damage the check valve, O ring seat, and diaphragm mating surfaces.**

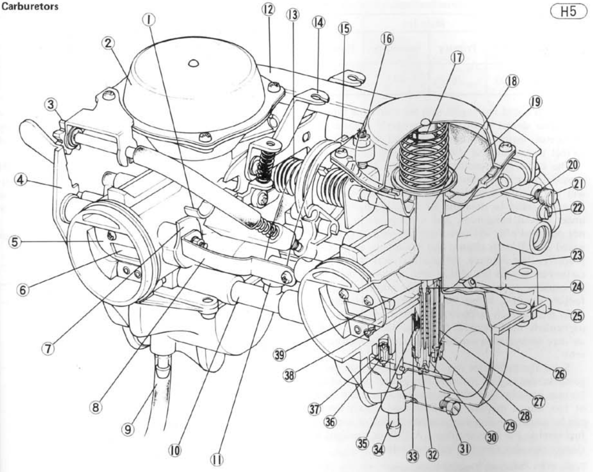
CARBURETORS

The carburetors perform the function of mixing the fuel and air in the proportions necessary for good engine performance at varying speeds and loads. In order for them to function satisfactorily, they must be kept well adjusted and maintained. The throttle cable adjustment (Pg. 15) and the pilot screw, idling, and synchronizing adjustments (Pg. 18) are covered in the Adjustment Section. The discussion here concerns the fundamentals of carburetor operation, special adjustments, and the checking and replacement of carburetor parts.

A linkage mechanism turns each carburetor butterfly valve the same amount in response to throttle grip movement so that the carburetors operate in unison. As the throttle grip is turned counterclockwise, the throttle accelerator cable turns the carburetor pulley,

Carburetors

(H5)



1. Idling Link
2. Upper Chamber Cover
3. Idle Adjusting Screw
4. Choke Lever
5. Choke Valve
6. Relief Valve
7. Idling Cam
8. Choke Link Plate
9. Overflow Tube
10. 3-way Joint
11. Fuel Hose
12. Upper Mounting Plate
13. Return Spring
14. Cable Bracket
15. Pulley
16. Balance Adjusting Screw
17. Spring
18. Vacuum Piston
19. Diaphragm
20. Pilot Screw
21. Pilot Screw Limiter
22. Vacuum Plug
23. Carburetor Body
24. Needle Jet
25. Lower Mounting Plate
26. Float Bowl
27. Bleed Pipe
28. Float
29. Primary Main Jet
30. Needle Jet Holder
31. Drain Plug
32. Secondary Main Jet
33. Plug
34. Overflow Pipe
35. Pilot Jet
36. Float Valve Needle
37. Float Valve Seat
38. Air Jet
39. Jet Needle

which through the linkage mechanism opens the butterfly valves. As the throttle grip is turned clockwise or is released, the return spring, together with the throttle decelerator cable, closes the butterfly valves.

One of the basic principles in carburetor operation is that the pressure exerted by a moving body of air is less than atmospheric pressure. As the engine draws air in through the carburetor bore, the air pressure in the carburetor bore is less than the air pressure in the float chamber, which is at atmospheric pressure. This difference in air pressure forces the fuel up through the passages into the carburetor bore where it is then atomized by the air, which is flowing at high speed to the engine.

Another important principle is the Venturi Principle, which states that when an air passage narrows, moving air flows faster, exerting even less pressure. For example, at low speeds ($0 \sim 1/4$ throttle) the vacuum piston is at its lowest position, forming what is called the "primary venturi". Since the engine intake requires less air at lower engine speeds, there would not be enough air flow speed for sufficient fuel to be forced up through the jets unless the passage (carburetor bore) above the jets is constricted. The low position of the vacuum piston constricts this passage so that there will be sufficient air flow speed for pressure difference to force the necessary amount of fuel up through the jet.

The amount of fuel passing through a jet depends both on the size of the jet (variable in the case of the needle jet) and on the speed of the air flow over the jet. The speed of this air flow is in turn determined both by the engine rpm and by the dimensions of the passage (varied with the vacuum piston) just above the jet. The size of the jet openings, the various dimensions of the

Table H1 Carburetor Specifications

Type	Jet Needle	Main Jet		Air Jet			Pilot Jet	Pilot Screw	Fuel Level	
		Primary	Secondary	Pilot	Primary Main	Secondary Main			Design	Service
VB32	003303	70	90	115	150	60	35	1¼ ± ½ turns out	32~34 mm	1.5~3.5 mm

air passages, and the engine rpm are correlated through carburetor design so that, when properly adjusted, the carburetor meters (measures) the fuel and air in the correct proportions at different throttle openings.

The carburetor specifications (Table H1) have been chosen for best all around performance, and ordinarily will not require any change. However, sometimes an alteration may be desirable for improved performance under special conditions, and when proper mixture is not obtained after the carburetor has been properly adjusted and all parts cleaned and found to be functioning properly. For example, the quantity of air entering the carburetor bore is less at high altitude due to the lower atmospheric pressure. To obtain the proper carburetor fuel/air mixture, it may be necessary to exchange the main jets on each carburetor for one a size smaller. In particularly cold weather, the increased density of the air may necessitate a size larger main jets for each carburetor.

Since the carburetor regulates and mixes fuel and air going to the engine, there are two general types of carburetor trouble: too rich a mixture (too much fuel); or too lean a mixture (too little fuel). Such trouble can be caused by dirt, wear, maladjustment, or improper fuel level in the float chamber. A dirty or damaged air cleaner can also alter the fuel-to-air ratio.

Table H2 Mixture Trouble Symptoms

Mixture too rich	Mixture too lean
Engine is sluggish	Engine overheats
Smoky exhaust	Runs better with choke lever pulled up
Runs worse when warn	Spark plug burned white
Spark plug fouled black	Runnning is unstable
Runs better without air cleaner	Loss of power

The following explanation of the functioning and maintenance of the carburetors covers the four main systems for fuel regulation and supply.

Table H3 Carburetor Systems

System	Function
Starter System	Supplies the necessary rich mixture for starting a cold engine.
Pilot System	Supplies fuel at idling and low speeds.
Main System	Supplies fuel at medium and high speeds.
Float System	Maintains the fuel at a constant level in the float chamber.

CAUTION 1. **Remove the diaphragm and float before cleaning the carburetor with compressed air, or they will be damaged.**

2. **Remove as many rubber or plastic parts from the carburetors (Table H4) as possible before cleaning the carburetors with a cleaning solution. This will prevent damage or deterioration of the parts.**
3. **The carburetor body has plastic parts (Table H4) that cannot be removed. DO NOT use a strong carburetor cleaning solution which could attack these parts; instead, use a mild cleaning solution safe for plastic parts.**
4. **Do not use wire for cleaning as this could damage the jets.**

Table H4 Carburetor Rubber Parts and Plastic Parts

Parts	Quantity	Removable
Breather Tubes	2	Yes
Cable Bracket Washers	4	Yes
Floats	2	Yes
Float Bowl O Rings	2	Yes
Fuel Hose	1	Yes
Idle Adjusting Screw	1	Yes
Idle Limiter	2	Yes
Jet Needle Holder	2	Yes
Overflow Tubes	2	Yes
Pilot Jet Rubber Plugs	2	Yes
Pilot Screw O Rings	2	Yes
3-way Joint O Rings	4	Yes
Vacuum Hose	1	Yes
Vacuum Pistons	2	Yes

Starter System

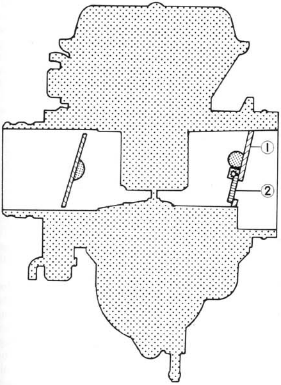
Fig. H6 shows the starter system, which includes the choke lever, choke valve ①, relief valve ②, idling cam, and idling link.

The starter system provides the exceptionally rich fuel/air ratio that is necessary to enable easy starting when the engine is cold. When starting the engine, the choke valves close down the carburetor bores by pulling up the choke lever. Since the choke valves close down the carburetor bores, a high intake vacuum (suction or low pressure) is developed at the engine side of the carburetor bores. The relief valves on the choke valves are opened by a high intake vacuum, and air is drawn into the carburetor bores. As the engine is cranked over, fuel is drawn in from the float chamber through the main jets and pilot jet. This fuel is then drawn into the carburetor, mixed with the air drawn in through the relief valve, and drawn into the engine.

The engine must be run at a faster than normal idle speed to prevent the engine from stalling until it reaches operating temperature. To accomplish this, the fast idling cam pushes the idling link when the choke lever is pulled up, and the throttle valve is held open an amount sufficient to prevent stalling.

Starter System

H6



1. Choke Valve 2. Relief Valve

In order for the starter system to work properly, the choke lever must be pushed up fully so that the choke valve will be kept closed and sufficient vacuum can be built up at the engine of the carburetor bore. Clogged pilot jet, main jets, pilot air jet, needle jet holder and main jet bleed pipe will cause insufficient atomization, thus impairing starter efficiency. Fuel mixture trouble results if choke mechanism, pilot and main system is defective. A damaged relief valve will cause insufficient vacuum, thus impairing starter system efficiency. Fuel mixture trouble results if the choke valve does not open fully after the choke lever is returned.

Cleaning and inspection (See cautions on Pg. 152)

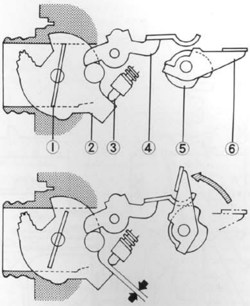
Disassemble the carburetor, and wash the main jets, pilot jet, needle jet holder, main jet bleed pipe, air jets, and air passage with a high flash-point solvent, blowing them clean with compressed air. If necessary, use a bath of automotive type carburetor cleaner.

Pull up and push down the choke lever to check that the choke valves move smoothly. The choke valves must close the carburetor bores completely when the lever is pulled up, and must open fully when the lever is pushed down. If necessary, adjust the choke linkage (Pg. 17). To check that the relief valve spring is working properly, push on the relief valve itself. The relief valve must move smoothly, and must close by spring tension.

If the choke valve or the relief valve does not work properly, replace the carburetor body.

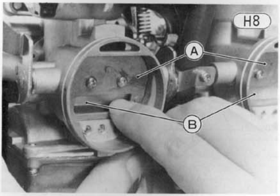
Fast Idle Mechanism

H7



1. Butterfly Valve
2. Pulley
3. Idle Adjusting Screw
4. Idling Link
5. Idling Cam
6. Choke Lever

H8

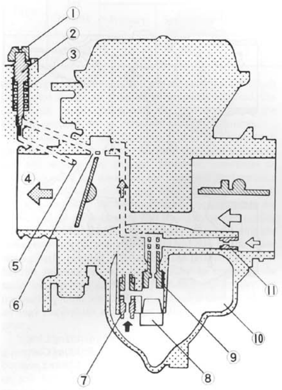


A. Choke Valves B. Relief Valves

Pilot System

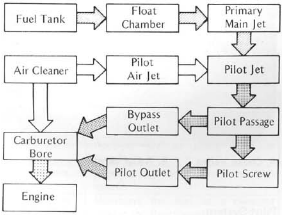
Fig. H9 shows the pilot system, which includes the pilot air jet ⑪, pilot jet ⑨, primary main jet ⑦, bypass outlet ⑥, pilot outlet ⑤, pilot screw ②, and pilot screw limiter ①.

Pilot System (H9)



1. Pilot Screw Limiter
2. Pilot Screw
3. Spring
4. Carburetor Bore
5. Pilot Outlet
6. Bypass Outlet
7. Primary Main Jet
8. Plug
9. Pilot Jet
10. Float Chamber
11. Pilot Air Jet

Pilot System Fuel and Air Supply (H10)

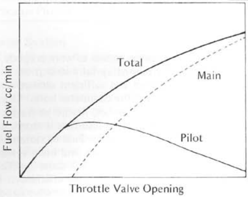


The pilot system determines the operation of the carburetor from 0 to ¼ throttle opening. At small throttle openings, almost no fuel is drawn through the main system due to insufficient air flow. Instead, the fuel is drawn through the main and pilot jets as a result of the low pressure (suction) brought about by the demand for air by the engine and the limited but relatively fast flow of air past the pilot outlet. The almost closed position of the butterfly valve restricts the carburetor bore air flow, preventing it from relieving the low pressure created by the engine around the pilot outlet while the Venturi effect (the narrower the air passage, the faster the flow of air) at the engine side of the butterfly valve further reduces the low pressure.

The supply of the fuel and air in the pilot system is shown in Fig. H10. At idling and slightly above, the fuel passes through the main jet, and is then metered at the pilot jet, where the fuel mixes with air metered by the pilot air jet. Then, the fuel passes through the pilot passage, where the pilot screw affects the flow, through the pilot outlet into the carburetor bore, and to the engine. As the butterfly valve turns a little more, the butterfly valve position extends the low pressure area to the pilot bypass, allowing fuel to bypass part of the pilot passage to go directly to the carburetor bore such that the supply of fuel increases sufficiently with engine need.

Fig. H11 shows throttle opening versus fuel flow for the main and pilot systems. If trouble occurs in the pilot system, not only are starting and low speed running affected, but the transition from pilot to main system is not smooth as the throtlte is opened, causing a drop in engine efficiency. Pilot system trouble might to be to maladjustment; a dirty or loose pilot jet, or pilot air jet; or clogging of the main jet, pilot passage, pilot outlet, or pilot bypass.

Fuel Flow Characteristics (H11)

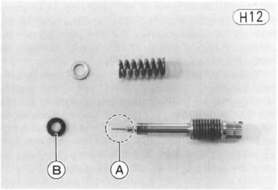


Cleaning and replacement
(See cautions on Pg. 152)

Disassemble the carburetor, and wash the primary main jet, pilot jet, pilot air jet, and air passage with a high flash-point solvent, blowing them clean with compressed air. If necessary, use a bath of automotive type carburetor cleaner.

Remove the pilot screw, and check that the tapered portion is not worn or otherwise deformed. If it is, replace the screw. If the screw **O** ring is damaged, replace the **O** ring.

(H12)

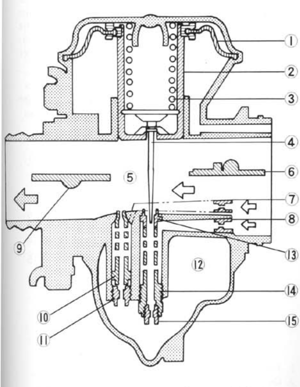


A. Tapered Portion **B. "O" Ring**

Main System

Fig. H13 shows the main system, which consists of the main jets (11), (15), main jet bleed pipe (10), needle jet holder (14), jet needle (4), needle jet (13), vacuum piston (2), spring (3), and main air jet (7), (8).

Main System (H13)



1. Diaphragm
2. Vacuum Piston
3. Spring
4. Jet Needle
5. Carburetor Bore
6. Choke Valve
7. Primary Main Air Jet
8. Secondary Main Air Jet
9. Butterfly Valve
10. Bleed Pipe
11. Primary Main Jet
12. Float Chamber
13. Needle Jet
14. Needle Jet Holder
15. Secondary Main Jet

Main System Fuel and Air Supply (H14)

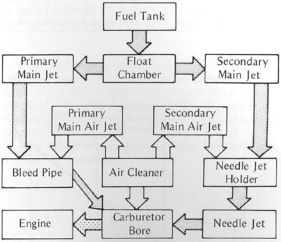


Fig. H14 shows the supply of fuel and air in the main system. From about ¼ ~ ½ throttle opening, the air flow past the main jet bleed pipe is sufficient to cause fuel to be drawn through the main system, and from about ½ throttle opening, the air flow past the needle jet outlet is sufficient too. The fuel passes through the primary main jet and then part of it goes through the pilot jet as in the pilot system while the rest of it passes straight up through the main jet bleed pipe at about ¼ ~ ½ throttle opening, and from about ½ throttle opening, the fuel passes through the secondary main jet and then it goes straight up through the space in the needle jet not blocked by the jet needle and into the carburetor bore, where it is atomized by the air flow to the engine.

The needle jet holder and main jet bleed pipe have holes to admit the air metered by the main air jets. This air mixes with the fuel in the needle jet holder and main jet bleed pipe to prepare the fuel for better atomization in the carburetor bore.

The lower part of the jet needle is tapered and extends down into the needle jet and needle jet holder. It is fixed to the vacuum piston, and thus rises up in the needle jet and needle jet holder as the vacuum piston rises. From the time the vacuum piston starts rising, from about ¼ throttle, until it reaches most of the way up in the carburetor bore, the fuel is metered primarily by the primary main jet and secondarily by the jet needle taper. As the jet needle rises, the needle to jet clearance increases, thereby increasing the amount of fuel that can pass up through the jet.

The vacuum piston is attached to the diaphragm and rises only between ¼ and ¾ throttle. Through the holes in the bottom of the piston, the air pressure in the chamber above the diaphragm is reduced by engine intake vacuum. The air vent maintains atmospheric pressure in the chamber under the diaphragm. As engine speed increases, air pressure in the upper chamber decreases. The difference between this pressure and atmospheric pressure in the lower chamber becomes