

## CHAPTER SEVEN

# FUEL, EMISSION CONTROL AND EXHAUST SYSTEMS

The fuel system consists of the fuel tank, the shutoff valve, 4 carburetors and an air filter. The exhaust system consists of 4 exhaust pipes, a cross-over pipe and 2 mufflers on Radian models or on FZ600 models, a 4-into-2-into-1 exhaust pipe and muffler assembly.

The emission controls consist of crankcase emission system and, on California models, a fuel evaporative emission control system.

This chapter includes service procedures for all parts of the fuel system and exhaust system. Air filter service is covered in Chapter Three.

Carburetor specifications are covered in **Table 1** located at the end of this chapter.

### NOTE

*Where differences occur relating to the United Kingdom (UK) models they are identified. If there is no (UK) designation relating to a procedure, photo or illustration, it is identical to the United States (U.S.) models.*

### CARBURETOR OPERATION

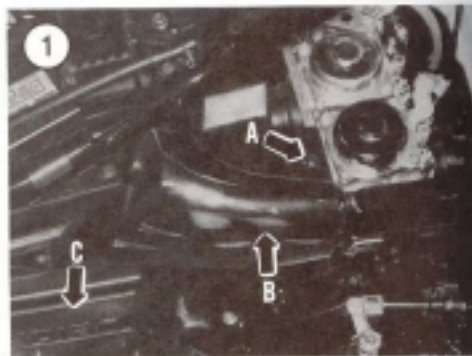
For proper operation, a gasoline engine must be supplied with fuel and air mixed in proper proportions by weight. A mixture in which there is an excess of fuel is said to be rich. A lean mixture is one which contains insufficient fuel. A properly adjusted

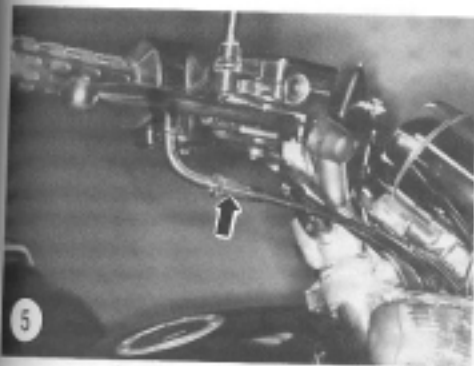
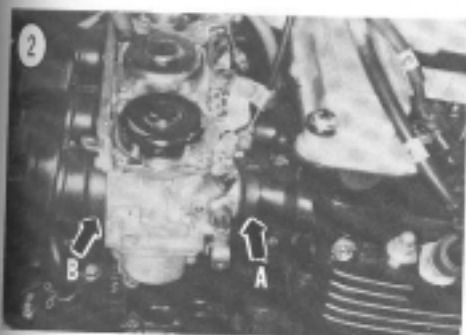
carburetor supplies the proper mixture to the engine under all operating conditions.

Each carburetor consists of several major systems. A float and float valve mechanism maintain a constant fuel level in the float bowls. The pilot system supplies fuel at low speeds. The main fuel system supplies fuel at medium and high speeds. A starter (choke) system supplies the very rich mixture needed to start a cold engine.

### CARBURETOR SERVICE

Major carburetor service (removal and cleaning) should be performed at the intervals indicated in **Table 2** in Chapter Three or when poor engine





performance, hesitation and little or no response to mixture adjustment is observed. Alterations in jet size, throttle slide cutaway, and changes in jet needle position, etc., should be attempted only if you're experienced in this type of "tuning" work; a bad guess could result in costly engine damage or, at least, poor performance. If, after servicing the carburetor and making the adjustments described in this chapter, the bike does not perform correctly (and assuming that other factors affecting performance are correct, such as ignition component condition, etc.), the bike should be checked by a dealer or a qualified performance tuning specialist.

## CARBURETOR ASSEMBLY

### Removal/Installation (Radian Models)

Remove all 4 carburetors as an assembled unit.

1. Remove the seat as described under *Seat Removal/Installation* in Chapter Twelve.
2. Disconnect the battery negative lead. See Chapter Three.
3. Remove the screws (A, **Figure 1**) securing the carburetor cover on each side and remove both covers (B, **Figure 1**).
4. Remove the fuel tank as described in this chapter.
5. Remove both frame side covers (C, **Figure 1**).
6. Remove the battery as described under *Battery Removal and Installation* in Chapter Three.
7. Loosen the screws on the 4 clamping bands on the front intake tubes (A, **Figure 2**) and slide the clamping bands away from the carburetors.
8. Loosen the screws on the 4 clamping bands on the rear intake tubes (B, **Figure 2**) and slide the clamping bands away from the carburetors.
9. Remove the tool kit and remove the screw located in the tool kit tray (**Figure 3**).
10. Remove the bolts securing the top of the air filter case (**Figure 4**) to the frame.
11. Loosen the locknut and turn the throttle cable adjuster (**Figure 5**) at the throttle lever to allow slack in the cable.
12. Loosen the choke cable clamp screw (A, **Figure 6**) and remove the cable end from the choke lever on the No. 4 carburetor.
13. Pull the air filter air case and battery case toward the rear and disengage it from all 4 carburetors.

14. Pull the carburetor assembly toward the rear and free the assembly from the intake tubes on the cylinder head.
15. Partially pull the carburetor assembly toward the right-hand side.
16. Pull the throttle cable from its holder (Figure 7) on the carburetor assembly.
17. At the carburetor, hold the lever up with one hand and disengage the throttle cable end (B, Figure 6). Slip the cable out through the carburetor bracket.
18. Carefully remove the carburetor from the engine and frame and take it to a workbench for disassembly and cleaning.

**NOTE**

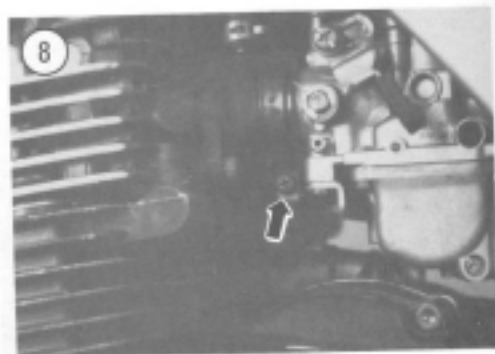
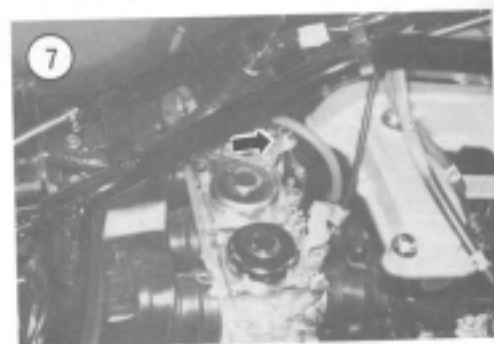
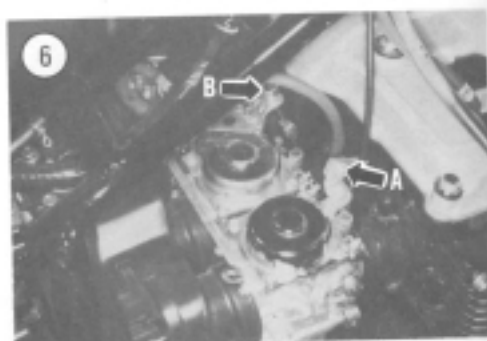
*Drain most of the gasoline from the carburetor assembly and place the assembly in a clean heavy-duty plastic bag to keep it clean until it is worked on or reinstalled.*

19. While the carburetor assembly is removed, examine the intake manifolds on the cylinder head and the rubber carburetor boots on the air filter box for any cracks or damage that would allow unfiltered air to enter the engine. Replace any damaged parts.
20. Place lint-free cloths into the 4 intake tubes in the cylinder head to prevent the entry of foreign matter.
21. Install by reversing these removal steps while noting the following:
  - a. Make sure the carburetors are fully seated forward in the rubber holders in the cylinder head. You should feel a solid "bottoming out" when they are correctly seated.
  - b. Make sure the screws on the clamping bands are tight to avoid a vacuum loss and possible valve damage due to a lean fuel mixture.
  - c. Adjust the throttle cable as described under *Throttle Cable Adjustment* in Chapter Three.

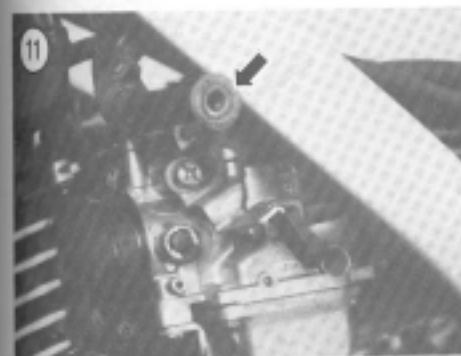
#### Removal/Installation (FZ600 Models)

- Remove all 4 carburetors as an assembled unit.
1. Remove the ride and passenger seats as described under *Seat Removal/Installation* in Chapter Twelve.
  2. Remove the lower fairing on each side as described under *Lower Fairing Removal/Installation* in Chapter Twelve. Remove the lower fairing stays.

3. Remove the exhaust system as described under *Exhaust System Removal/Installation (FZ600 Models)* in this chapter.
4. Place wood block(s) under the engine to support the bike securely.
5. Disconnect the battery negative lead. See Chapter Three.
6. Remove the fuel tank as described in this chapter.
7. Remove both frame side covers as described under *Side Cover Removal/Installation* in Chapter Twelve.



8. Remove the battery as described under *Battery Removal and Installation* in Chapter Three.
9. Remove the bolts securing the battery case and remove the case from the frame.
10. Remove the bolts securing the air filter case to the frame.
11. Loosen the screws on the 4 clamping bands on the front intake tubes (Figure 8) and slide the clamping bands away from the carburetors.



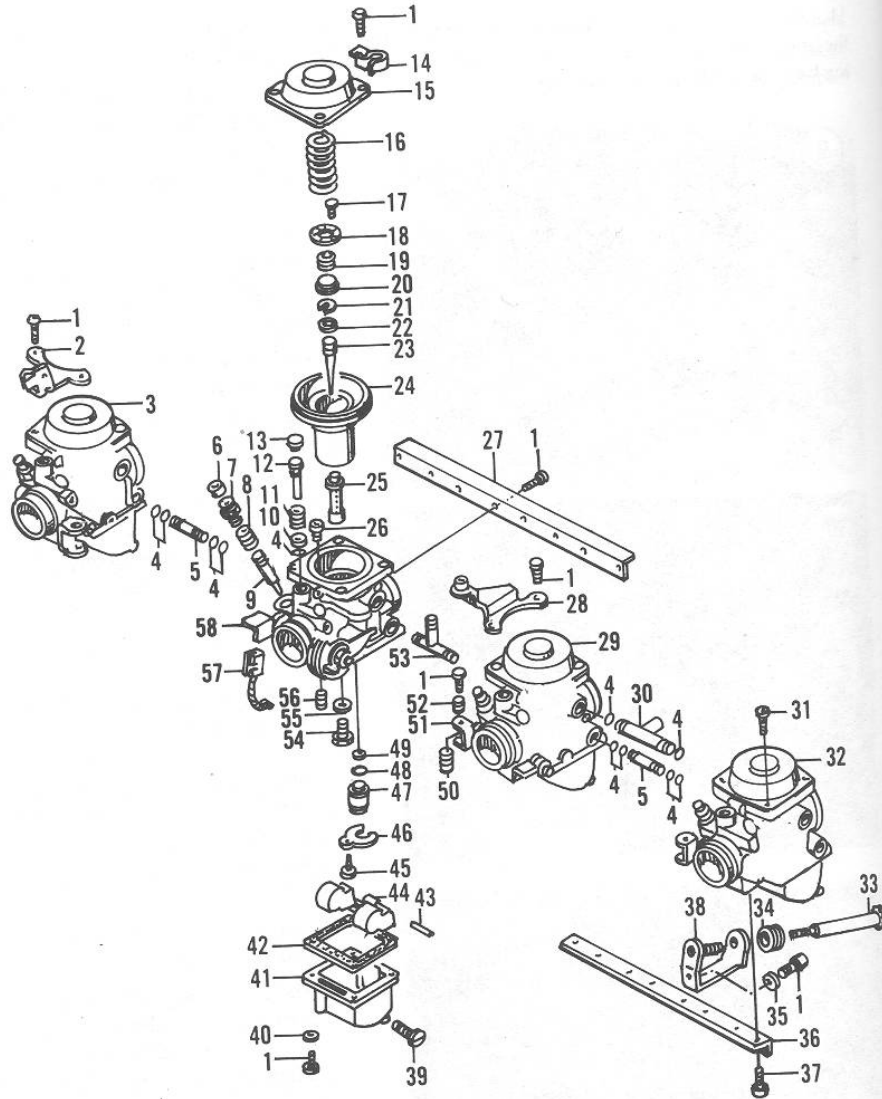
12. Loosen the screws on the 4 clamping bands on the rear intake tubes and slide the clamping bands away from the carburetors.
13. Loosen the locknut and turn the throttle cable adjuster at the throttle lever (Figure 9) to allow slack in the cable.
14. Pull the air filter air case and battery case toward the rear and disengage it from all 4 carburetors.
15. Pull the carburetor assembly toward the rear and free the assembly from the intake tubes on the cylinder head.
16. Pull the throttle cable from its holder (Figure 10) on the carburetor assembly.
17. At the carburetor, hold the lever up with one hand and disengage the throttle cable end. Slip the cable out through the carburetor bracket.
18. Remove the upper fairing mounting brackets on each side (Figure 11).
19. Carefully remove the carburetor from the engine and frame and take it to a workbench for disassembly and cleaning.

**NOTE**

*Drain most of the gasoline from the carburetor assembly and place the assembly in a clean heavy-duty plastic bag to keep it clean until it is worked on or reinstalled.*

20. While the carburetor assembly is removed, examine the intake manifolds on the cylinder head and the rubber carburetor boots on the air filter box for any cracks or damage that would allow unfiltered air to enter the engine. Replace any damaged parts.
21. Place lint-free cloths into the 4 intake tubes in the cylinder head to prevent the entry of foreign matter.
22. Install by reversing these removal steps while noting the following:
  - a. Make sure the carburetors are fully seated forward in the rubber holders in the cylinder head. You should feel a solid "bottoming out" when they are correctly seated.
  - b. Make sure the screws on the clamping bands are tight to avoid a vacuum loss and possible valve damage due to a lean fuel mixture.
  - c. Adjust the throttle cable as described under *Throttle Cable Adjustment* in Chapter Three.

12



**CARBURETOR**

1. Screw
2. Cable clamp
3. No. 4 carburetor
4. O-rings
5. Connecting pipe
6. Plunger cap
7. Plunger cap cover
8. Spring
9. Starter plunger
10. O-ring
11. Spring
12. Pilot screw
13. Cap
14. Cable clamp
15. Diaphragm cover
16. Spring
17. Screw
18. Spring seat
19. Spring
20. Washer
21. Clip
22. Ring
23. Jet needle
24. Diaphragm assembly
25. Main jet nozzle
26. Pilot air jet
27. Mounting plate
28. Connecting plate
29. No. 2 carburetor
30. Connecting "T"
31. Screw
32. No. 1 carburetor
33. Throttle adjust screw
34. Spring
35. Washer
36. Mounting plate
37. Screw
38. Bracket
39. Drain screw
40. Washer
41. Float bowl
42. Gasket
43. Pivot pin
44. Float
45. Screw
46. Plate
47. Needle jet
48. O-ring
49. Filter
50. Spring
51. Bracket
52. Spring
53. Connecting "T"
54. Main jet
55. Washer
56. Pilot jet
57. Cable
58. No. 3 carburetor

**CARBURETOR****Disassembly/Assembly**

Refer to **Figure 12** for this procedure. It is recommended that one carburetor be disassembled at a time. This will prevent a mixup of parts.

All components that require cleaning can be removed from the carburetor body without removing the carburetors from the mounting plates. *Do not* separate the carburetors as misalignment will occur on reassembly.

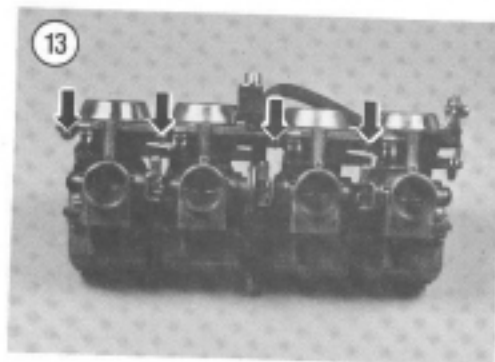
**CAUTION**

*When cleaning the carburetor assembly, do not turn the pilot screw, as it has been preset at the factory. Changing the basic setting will actually decrease engine performance. Carburetor adjustments which can be performed are described in Chapter Three.*

**NOTE**

*The carburetors are numbered in the same sequence as the engine cylinders. The No. 1 carburetor is on the left-hand side and the No. 2, 3, and 4 continue from left to right. Remember, the left-hand side refers to the carburetor assembly as it sits in the bike's frame, not as it sits on your workbench.*

1. Loosen the screws on the choke lever shaft (**Figure 13**) and remove the shaft from all four carburetors.
2. Remove the screws securing the diaphragm cover and remove the cover (**Figure 14**).
3. Remove the spring and diaphragm (**Figure 15**).



**NOTE**

To remove the diaphragm cover on the No. 2, 3 and 4 carburetors, you must remove the throttle cable and clutch cable supports and the fuel line guide (Figure 16). After removing these parts, store them in a separate plastic bag to prevent interchanging parts.

4. Remove the screws securing the float bowl and remove the float bowl and gasket.

5. Remove the float pivot pin (Figure 17).

6. Remove the float and the float valve needle (Figure 18).

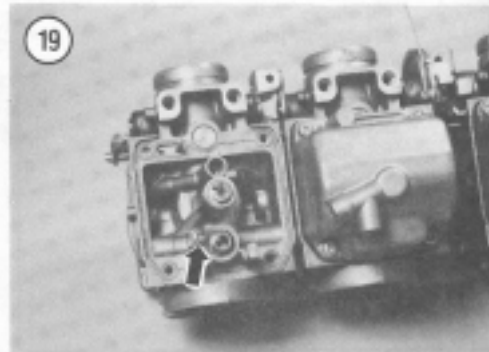
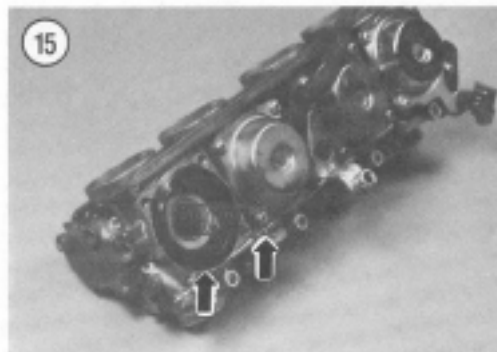
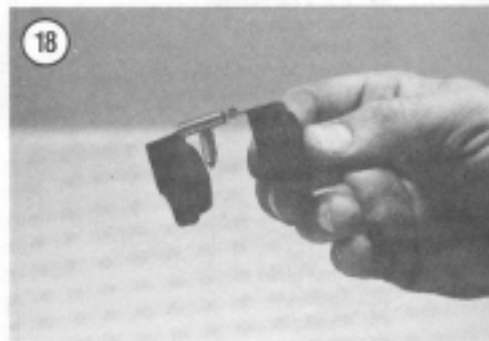
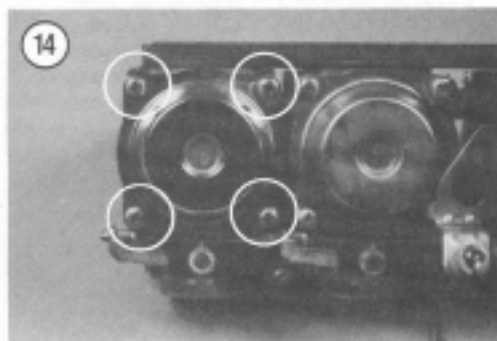
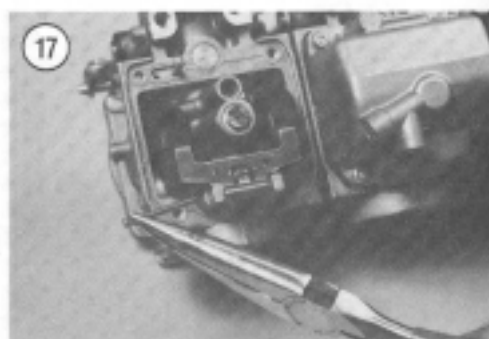
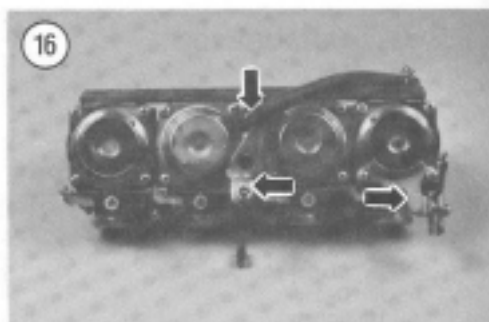
7. Remove the screw (Figure 19) securing the needle valve seat and remove the needle seat (Figure 20).

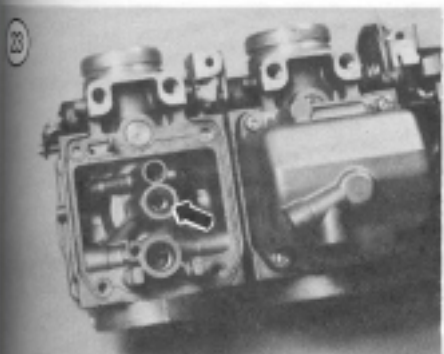
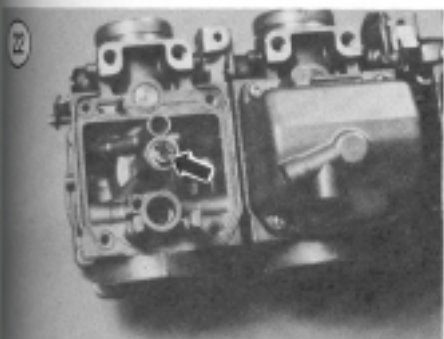
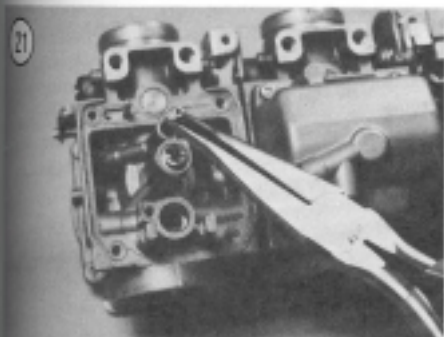
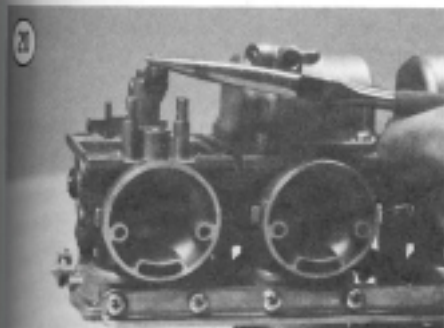
8. Use a small screwdriver and loosen the pilot jet, then remove it (Figure 21).

9. Unscrew the main jet (Figure 22) and remove the main jet washer (Figure 23).

10. Remove the needle jet (Figure 24).

11. Remove the pilot air jet (Figure 25).

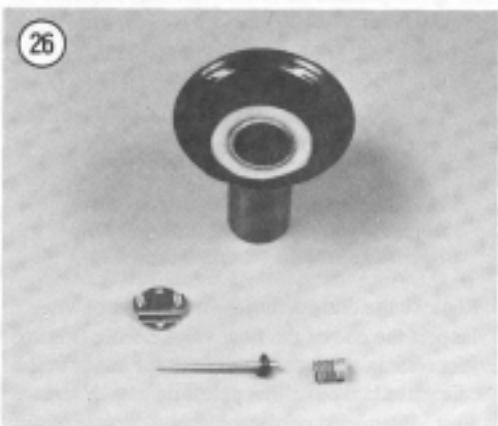
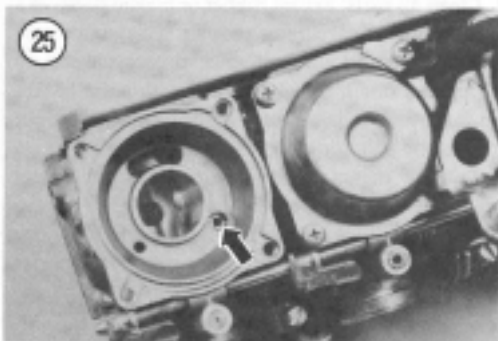
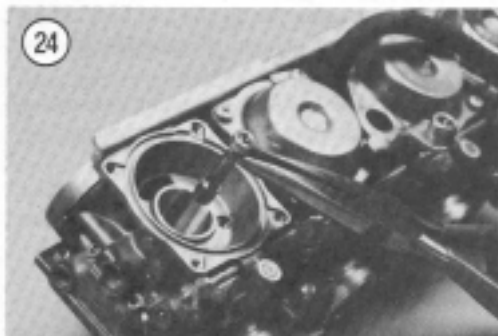




12. Remove the screws securing the diaphragm assembly and disassemble it (Figure 26). Replace any parts that appear to be worn or damaged.

**NOTE**

*Further disassembly is neither necessary nor recommended. If throttle or choke shafts or butterflies are damaged,*





take the carburetor body to a dealer for replacement.

13. Clean and inspect all parts as described under *Cleaning and Inspection* in this chapter.
14. Assembly is the reverse of these disassembly steps while noting the following:
  - a. After installing the needle jet, make sure the notch in the bottom of the needle jet aligns with the pin in the carburetor (Figure 27).
  - b. When installing the diaphragm, position the tab on the diaphragm (Figure 28) into the recess in the carburetor body.
15. Repeat Steps 2-14 for the remaining three carburetors. Do not interchange parts—keep them separate.
16. After the carburetors have been disassembled, the idle speed should be adjusted and the carburetors synchronized as described in Chapter Three.

### Cleaning and Inspection

1. Clean all parts, except rubber or plastic parts, in a good grade of carburetor cleaner. This solution is available at most automotive or motorcycle supply stores in a small, resealable tank with a dip basket for just a few dollars. If it is tightly sealed when not in use, the solution will last for several cleanings. Follow the manufacturer's instructions for correct soak time (usually about 1/2 hour).
2. Remove all parts from the cleaner and blow dry with compressed air. Blow out the jets and needle jet holder with compressed air.

#### CAUTION

*If compressed air is not available, allow the parts to air dry or use a clean lint-free cloth. Do not use a paper towel to dry carburetor parts, as small paper particles may plug openings in the carburetor body or jets.*

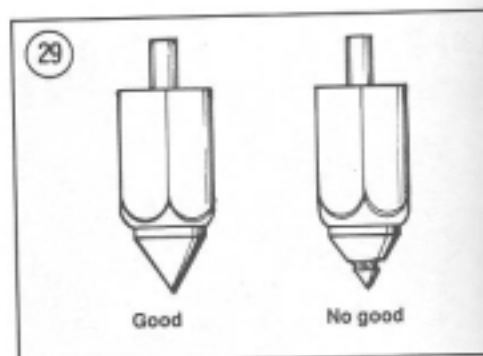
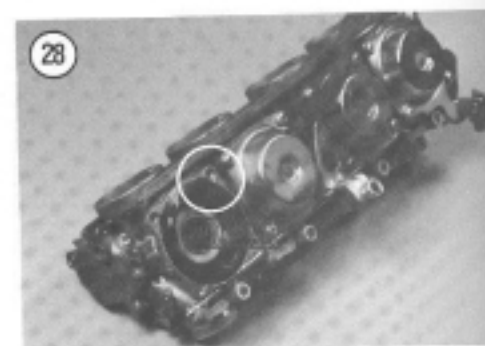
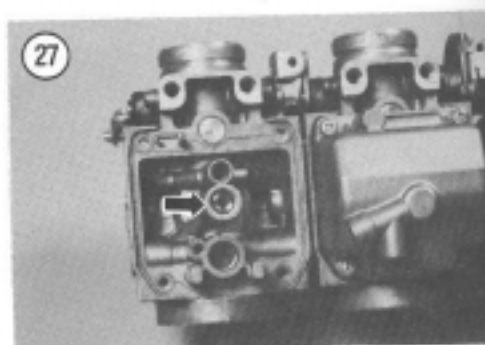
#### CAUTION

*Do not use a piece of wire to clean them as minor gouges in the jet can alter flow rate and upset the fuel/air mixture.*

3. Remove the drain screw from the float bowl.
4. Inspect the end of the float valve needle (Figure 29) for wear or damage. Also check the inside of the needle valve body. If either part is damaged, replace as a set. A damaged needle valve or a particle of dirt

or grit in the needle valve assembly will cause the carburetor to flood and overflow fuel.

5. Inspect all O-ring seals. O-ring seals tend to become hardened after prolonged use and heat and therefore lose their ability to seal properly.
6. Make sure the holes in the needle jet are clear. Clean out if they are plugged in any way. Replace the needle jet if you cannot unplug the holes.
7. Make sure all openings in the carburetor body are clear. Clean out if they are plugged in any way.

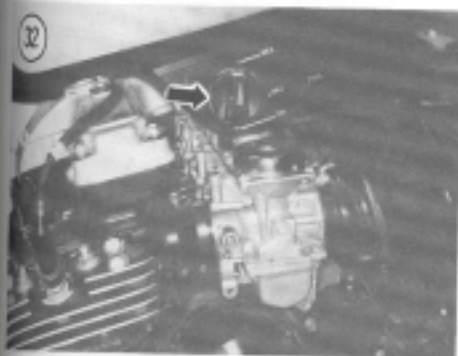
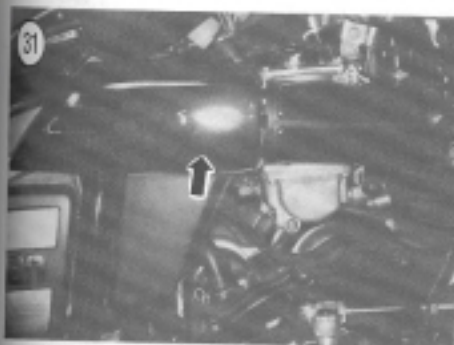
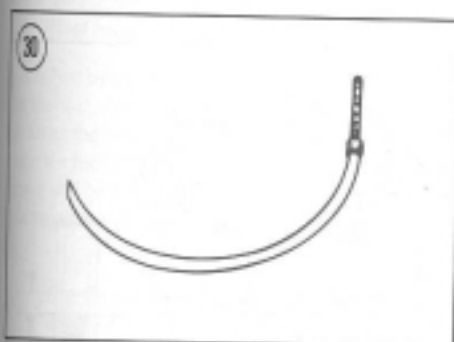


## CARBURETOR ADJUSTMENTS

## Fuel Level Measurement

The fuel level in the carburetor float bowls is critical to proper performance. The fuel flow rate from the bowl up to the carburetor bore depends not only on the vacuum in the throttle bore and the size of the jets, but also on the fuel level.

The measurement is more useful than a simple float height measurement because the actual fuel



level can vary from bike to bike even when their floats are set at the same height. The bike must be *exactly level* for this procedure to be accurate. Place pieces of wood or shims under the centerstand or place a suitable jack under the engine to position the bike so that the carburetor assembly is level from side to side.

Fuel level inspection requires a special Yamaha Fuel Level Gauge (U.S. part No. YM-01312, UK part No. 90890-01312) and the Yamaha Fuel Level Gauge adapter (U.S. part No. YM-01329, UK part No. 90890-01329) that is shown in **Figure 30**. A substitute for the special tool is a piece of clear vinyl tubing with an inside diameter of 6 mm (0.24 in.) and must be long enough to reach from side of the carburetor assembly to the other.

## WARNING

*Before starting any procedure involving gasoline, have a class B fire extinguisher rated for gasoline or chemical fires within reach. Do not smoke, allow anyone to smoke or work in an area where there is an open flame. The work area must be well ventilated—preferably outdoors.*

1A. On FZ600 models, remove the lower fairing on each side as described under *Lower Fairing Removal/Installation* in Chapter Twelve.

1B. On Radian models, remove the screws securing the carburetor cover on each side and remove both covers (**Figure 31**).

2. Place the bike in a vertical position on the centerstand or have an assistant hold it in this position.

3. Turn the fuel shutoff valve to the ON or RES position (**Figure 32**).

4. Start with the No. 1 carburetor (left-hand side). Place a small container under the carburetor to catch any fuel that may drip from the float bowl.

## NOTE

*Figure 33 is shown with the carburetor assembly removed for clarity and shows the fuel level gauge adapter holes for each carburetor. Do not remove the carburetor assembly for this procedure.*

5. Install the adapter into the drain hole in the carburetor float bowl (**Figure 33**). Connect the fuel level gauge tube to the adapter.

6. Hold the loose end of the tube up above the float bowl level (Figure 34) and loosen the drain screw. When the drain screw is loosened, fuel will flow into the gauge tube. Make sure to hold the loose end of the tube up or the fuel will flow out of the tube and onto the engine.

7. Start the engine and let it idle for 2-3 minutes. This is necessary to make sure the fuel level is at normal operating level in the float bowl. Shut the engine off.

8. Hold the loose end of the tube up against the No. 1 carburetor body (Figure 34). Mark the fuel level in relation to the top of the float bowl on the tube with a piece of masking tape or with a grease pencil.

9. Insert a golf tee into the open end of the tube so that fuel will not drain out when moving the hose from side to side.

**NOTE**

*Always insert a golf tee in the fuel-filled tube whenever moving the tube from side to side.*

10. Move the tube to the other side of the bike and remove the golf tee. Repeat Step 7, holding the tube up against the No. 4 carburetor body (right-hand). The fuel level in the tube should be the same; if not, the bike and the carburetor assembly are not level. Readjust the shims or jack until the carburetor assembly is exactly level—this is necessary to obtain correct measurements. Repeat Steps 5-8 until the bike and carburetor assembly are exactly level.

11. After the carburetor assembly is level, hold the loose end of the tube up against the No. 1 carburetor body. Check the fuel level in the tube. It should be  $2 \pm 1\text{mm}$  ( $0.079 \pm 0.039$  in.) below the top surface of the float bowl (Figure 34).

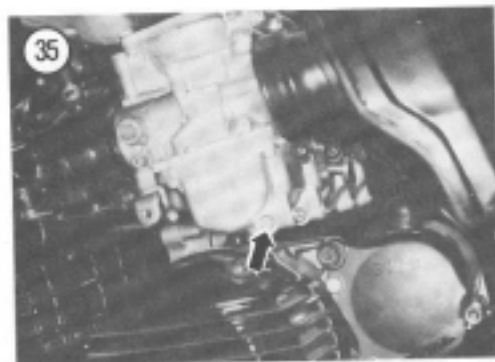
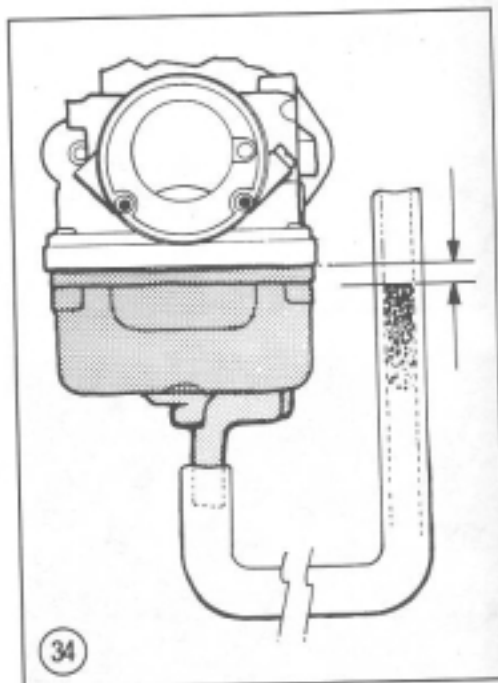
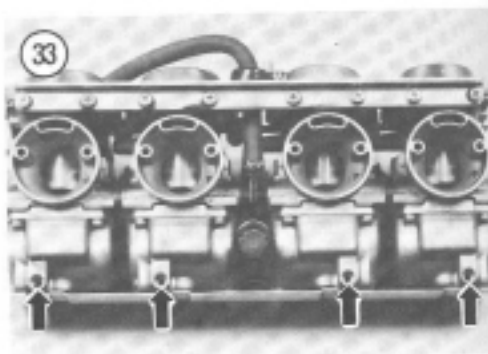
12. Tighten the drain screw (Figure 35) and hold both ends of the tube at the same height so the fuel will not drain out.

**WARNING**

*Do not let any fuel spill on the hot exhaust system.*

13. Remove the tube from the adapter, then remove the adapter. Immediately wipe up any spilled fuel from the engine.

14. Repeat this procedure for the No. 2, 3 and 4 carburetors. Record the measurements for all 4 carburetors.



15. If the fuel level is incorrect on any of the carburetors, remove the carburetor assembly and adjust the float tang on the affected carburetor(s).
16. Remove the carburetor assembly as described in this chapter.
17. Remove the screws securing the float bowls and remove them.

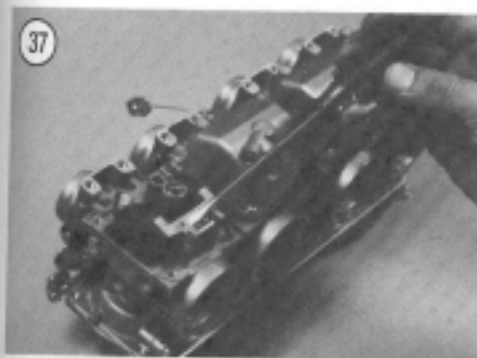
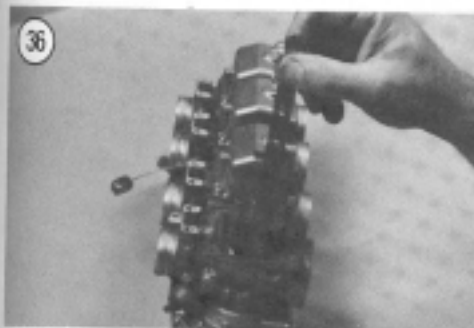
**NOTE**

*If the fuel level is correct on one or more of the carburetors, measure the installed float height (Figure 36) and use the measurement as a guide for correct float height.*

18. Adjust by carefully bending the tang (Figure 37) on the float arm. Bend the tang upward very slightly to lower the fuel level; bend the tang downward to raise the fuel level. If the float level is too high, the result will be a rich fuel/air mixture. If it is too low, the mixture will be too lean.

**NOTE**

*The floats on all carburetors must be adjusted at the same height to maintain the same fuel/air mixture.*



19. Reassemble and install the carburetors as described in this chapter.

**Rejetting The Carburetors**

Do not try to solve a poor running engine problem by rejetting the carburetors if all of the following conditions hold true:

- a. The engine has held a good tune in the past with the standard jetting.
- b. The engine has not been modified.
- c. The motorcycle is being operated in the same geographical region under the same general climatic conditions as in the past.
- d. The motorcycle was and is being ridden at average highway speeds.

If those conditions all hold true, the chances are that the problem is due to a malfunction in the carburetor or in another component that needs to be adjusted or repaired. Changing carburetor jet size probably won't solve the problem. Rejetting the carburetors may be necessary if any of the following conditions hold true:

- a. A non-standard type of air filter element is being used.
- b. A non-standard exhaust system is installed on the motorcycle.
- c. Any of the top end components in the engine (pistons, camshafts, valves, compression ratio, etc.) have been modified.
- d. The motorcycle is in use at considerably higher or lower altitudes or in a considerably hotter or colder climate than in the past.
- e. The motorcycle is being operated at considerably higher speeds than before and changing to colder spark plugs does not solve the problem.
- f. Someone has previously changed the carburetor jetting.
- g. The motorcycle has never held a satisfactory engine tune.

If it is necessary to rejet the carburetors, check with a dealer or motorcycle performance tuner for recommendations as to the size of jets to install for your specific situation.

If you do change the jets, do so only one size at a time. After rejetting, test ride the bike and perform a spark plug test; refer to *Reading Spark Plugs* in Chapter Three.