This chapter provides procedures for the engine top end and exhaust system. Engine removal is required to service all top end components.

Tables 1-3 are at the end of this chapter.

The V-Rod is liquid-cooled 60° V-twin engine with double overhead camshafts. The crankshaft is supported by two main bearings and the camshafts are chain driven by the timing sprocket on the right side of the crankshaft. The camshafts operate directly on top of the valve tappets, while shims under the valve tappets determine valve clearance.

The cylinders are an integral part of the upper crankcase. Refer to Chapter Five for upper crankcase/cylinder block procedures.

The lubrication system, covered in Chapter Five, is wet sump with the oil supply contained in the lower crankcase. The crankshaft driven oil pump delivers oil through the oil filter and then to the oil cooler. These components are covered in Chapter Five.

**ENGINE SERVICE**

1. Review Chapter One, especially the *Measuring Tools* and *Service Methods* sections. Accurate measurements are critical to a successful engine rebuild.
2. Clean the entire engine and frame with degreaser before removing engine components. A clean motorcycle is easier to work on and helps prevent the possibility of debris falling into the engine.
3. Cover the drive belt before degreasing the engine. The chemicals in the degreaser will damage the drive belt.
4. Have all the necessary tools and parts on hand before starting the procedure(s). Store all parts in boxes, plastic bags and various containers. Use masking tape and a permanent, waterproof marking pen to label parts. Record the location, position and thickness of all shims and washers as they are removed.
5. Engine service requires a number of special tools. These tools and their part numbers are described in the procedures. For a complete list of the tools mentioned in this manual, refer to Table 11 in Chapter One.
6. Use a box of assorted size and color vacuum hose identifiers for identifying hoses and fittings during engine services.
7. Throughout the text there are references to the left and right side of the engine. This refers to the engine as it is mounted in the frame, not how it may sit on the workbench or in an engine stand.
8. When inspecting components described in this chapter, compare the measurements to the service specifications in Table 2. Replace any part that is out of specification, worn to the service limit or damaged.
9. Always replace worn or damaged fasteners with those of the same size, type and torque requirements. If a torque specification for a specific fastener is not provided, refer to the torque recommendation table in Chapter One.
10. Use a vise with protective jaws to hold parts.
EXHAUST SYSTEM (ALL MODELS EXCEPT VRSCR, VRSCD AND VRSCDX MODELS)

1. Clamp
2. Heat shield–rear
3. Nut
4. Exhaust pipe–rear
5. Clamp
6. Gasket
7. Retaining ring
8. Exhaust pipe–front
9. Heat shield–front
10. Muffler–rear cylinder
11. Muffler–front cylinder
12. Clamp (all models except VRSCSE)
13. Clamp (all models except VRSCSE)
14. Clamp (VRSCSE models)
15. Clamp (VRSCSE models)
16. Washer (VRSCSE models)
17. Bolt (VRSCSE models)
18. Volume pipe
19. Heat shield–outer
20. Heat shield–inner
21. Screw
22. Lower mounting bracket
23. Washer
24. Bolt
25. Nut
26. Pin
27. Bracket
28. Lockwasher
29. Bolt
30. Rubber isolator
11. Use a press or special tools when force is required to remove and install parts. Do not try to pry, hammer or otherwise force them on or off.
12. Replace all O-rings and seals with new ones during assembly. Set aside old seals and O-rings so they can be compared with the new ones if necessary. Apply a small amount of grease to the inner lips of each new seal to prevent damage when the engine is first started.

EXHAUST SYSTEM (ALL MODELS EXCEPT VRSCR, VRSCD AND VRSCDX)

Removal

Refer to Figure 1.

WARNING
Do not remove or service the exhaust system when it is HOT.

NOTE
It is recommended to remove the exhaust system as an assembly to maintain the alignment of all components. The mufflers can be removed separately if needed.

1. Support the motorcycle on level ground on a swing arm stand.
2. Block the front wheel so the motorcycle will not roll in either direction while on the swing arm stand.
3. Remove the bolts securing the drive sprocket cover (Figure 2) and remove it. This is necessary to reach the rear cylinder left side flange nut.
4. Remove the clamps securing the heat shields (Figure 3). Remove all three heat shields to protect the finish. This is also necessary to assist in moving the exhaust pipe flange away from the cylinder head studs.
5. Remove the upper Allen bolt (Figure 4) securing the muffler assembly to the rear portion of the mounting bracket.
6. Remove the exhaust pipe flange nuts at the front cylinder head. Refer to Figure 5 and Figure 6.
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