

DISSECTION OF AN INTERNAL COMBUSTION ENGINE

Purpose: The purpose of this dissection is to familiarize you with the construction and operation of a Briggs & Stratton model 80232 one cylinder, four-stroke, internal combustion (IC) engine.

This lab will be completed in two lab sessions. During the first session and part of the second, you will be dissecting the engine. During the latter half of the second session, you will be putting the engine back together. Enough information will be given to you to enable you to dissect the engine in an orderly manner. You **MUST** keep track of the order of dissection, how parts are disassembled, what they are, and how many there are — bolt sizes and shapes, etc., so that you will be able to put the engine back together properly. You can not rely on memory to remember these, so label the disassembled parts and document all important information in your log books.

During the dissection, you will be asked to study the engine subassemblies and systems. If you do not understand how things work or why they are designed in the particular way they are, first take a look in the service and repair instruction manual (this is good practice) and then **ASK**.

Procedure: *Note: All of the tools you will need to dissect the engine are included in your lab kit. To prevent damage to the engine parts, please use only the provided tools during the dissection (using a pair of pliers to loosen a bolt is a great way to hurt yourself, the equipment, and not impress the teaching team).*

After setting up the engine and understanding your tools, start dissecting the engine according to the following steps. Again, make sure you document your actions and tag your parts, how they are disassembled, their order, and sizes and numbers. Answer all questions as go along.

1. Being careful not to touch the end of the spark plug while the engine is turning, have your partner hold the engine firmly and use the pull starter to turn the engine. Note that the output shaft on the other side turns simultaneously. How does it feel (easy, hard, both)? Why? Knowing that it's a four-stroke cycle engine should help explain why it feels the way it does.
2. Examine the auto-return pull-start mechanism. Draw a sketch of how you think it might work.
3. Disconnect the spark plug wire and remove the spark plug using the spark plug socket and wrench provided. Turn the engine with the pull start while being careful not to touch the end of the spark plug wire (high voltage) . How does it feel now? Why?
4. Using the 3/8" wrench or socket, remove the four bolts that hold the flywheel cover in place. Remove the mating cylinder cover with the 1/4" wrench or socket.
5. Using the 1/2" socket, remove the eight bolts that hold the cylinder head in place. In cases where several bolts are used to hold two parts together, you should get in the habit of loosening (or tightening) each bolt a little bit at a time instead of taking one bolt all of the way out while the others are still completely tight. This prevents warping of the two parts and helps to ensure an evenly distributed force holding the parts together. This will be very critical during reassembly. Gently remove the head gasket as it is easily damaged.

6. With the head removed, what do you see? (sketch) Explain the timing relationship of the piston to the valves. Which valve is the intake? Exhaust? Estimate the engine displacement $Bore \times Stroke$ and compression ratio:
$$\frac{\text{Maximum cylinder volume}}{\text{Minimum cylinder volume}}$$
7. What material is the head made of? What material is the cylinder block made of? Explain why you think these material were used. How does this relate to the function of the head gasket?
8. Now that you've witnessed the up-and-down motion of the piston, let's see how this reciprocating motion is converted into rotational motion. Using the 3/8" socket, remove the crankcase cover (it surrounds the output shaft). There will be a bit of oil in the crankcase so be ready with a rag to wipe it up.
9. Locate the crankshaft, connecting rod, crankshaft bearing, and camshaft. If it is still unclear how the piston motion turns the crankshaft, ask now.
10. What is the function of the camshaft? How is it driven? Calculate the speed ratio between the crankshaft and the camshaft. What is important about this ratio?
11. Find the small dented dot on the crank gear and the notch on the camshaft gear and match them by turning the crankshaft. Notice the location of the piston and the orientation of the connecting rod and the crank and record them. What is important about this relationship?

12. Remove the air filter cover and the air filter element. Why is the air filter element shaped the way it is?

13. Remove the lower air filter housing. Adjust the choke lever. What is the function of the choke?

14. Before continuing the fuel system dissection, examine the operation of the governor (see the repair instruction manual). Describe how it works.

15. Using the 3/8" wrench, remove the gas tank and carburetor assembly. In order to disconnect the governor linkage, the gas tank and carburetor assembly will have to be rotated up as it is removed.

16. Using a flat head screw driver remove the four screws that hold the carburetor on the tank. Carefully pry the carburetor off of the tank (the gasket will rip, this is OK). Carefully extract the fuel pipes from the tank.

17. Before dissecting the carburetor, locate the venturi from the outside of the carburetor. Where is the throttle valve relative to the venturi?

18. With a flat head screw driver remove the "Pulsa-Jet" fuel pump cover, diaphragm, spring, and cup. Inspect the diaphragm and examine its function. How does it act as a pump?

19. Draw a flow chart of what happens in the carburetor during acceleration.

20. Locate the flywheel. What is its function?

21. Review the section on the magneto ignition system from the handout (pp. 14 – 17). The current system is much simplified as it incorporates an electronic condenser and breaker points. Locate the magnet on the flywheel. What is its function? Note the relationship between the position of the magnet and the position of the piston and valves (you may have to rotate the crankshaft twice to see the correct relationship).

22. Returning to the crankcase, investigate the lubrication system. How are the crankshaft, camshaft, and cylinder walls lubricated? (Hint: imagine that the bottom of the crankcase is filled with a quart of oil)?

23. The dissection of the engine is now complete. You should have learned about the engine and its subassemblies as well as their function, operation, and construction. You should have documented the order of operations and parts to enable you to reassemble the engine.

24. Put all the part in bags and/or tag them if you have not done so. Put all the part in the box provided until the next session.

25. Clean your tools and your work area completely and store the engine parts and the tools appropriately.