



Tighten Up

How to make inboard engine valve adjustments yourself

BY CAPT. ALAN ROSS HUGENOT

Do you ever adjust your engine valves? Now that we're in the Digital Age, we are used to microelectronic gadgets that never need adjustment. Our computers may "crash," but they never really break — we usually just need to reboot

them. Even our automobiles need minimal attention, thanks to electronic ignition systems that allow engines to run for 65,000 miles without a tuneup, valve adjustment or even new spark plugs.

We may have become insensitive to the needs of

heavy machinery — however, we must never ignore the necessary mechanical adjustments on our boats.

During a long passage, our marine inboard engines may run for days — or even weeks — without being shut down. Their metallic parts are strong, but they are not indestructible, and maintaining proper clearances is very important.

Each engine's valve clearance is carefully calculated so that the valve and rocker arm assembly has room to expand as the engine components heat up, but also so that there is not too much clearance. With too much clearance, they will "slap," which could cause them to overheat.

ADJUST YOUR THINKING

Many people believe that engine valves don't need adjustment, as long as they are quiet. This is just plain wrong.

Doing a proper valve adjustment is a simple procedure that will help you become more familiar with your boat's inboard engine. Personally, I like to adjust my valves every spring, along with my annual change-out of the raw water pump impeller. When I'm adjusting the valves on a gasoline engine, I also do an ignition system tuneup the same day.

Adjusting the valves can be done in less than two hours, once you have learned the proper procedure.

If your engines were built before 1980, the valve stem-to-rocker arm clearance should be checked and adjusted after every 50 hours of operation. On newer engines, this clearance should be checked and adjusted every 250 hours or so, in accordance with the engine manufacturer's recommendations.

For most boats, an annual valve adjustment is just the ticket.

Here's how your engine's valves operate: The camshaft, which is turned by the engine flywheel, has lifters that raise a push rod for each valve. That, in turn, pushes the rocker arm, which depresses the tappet onto the valve stem and depresses a spring that opens the valve. As the valve moves away from the seat,

it lets air into the cylinder or exhaust out of the cylinder.

What happens if the valves are not properly adjusted?

If the valve clearance is too small, as the engine heats up and all the metal parts expand, a valve may stay slightly open all the time. This will result in lost compression, with burned valves and seats.

If the clearance is too large, valve openings will be delayed, the valve will not open far enough and the valve will close too soon, resulting in incomplete intake, exhaust or both.

All of this can cause damage to your engine that will require major repairs — and maybe even a complete engine overhaul.

CHECKING AND ADJUSTING VALVE CLEARANCE

This procedure is for both diesel and gasoline engines:

1 Warm up the engine for 30 minutes, under load. It's easiest to do this by running at 1,500 rpm in gear, against the dock lines. After the engine reaches its full operating temperature of 180 degrees Fahrenheit, shut off the engine. Valve clearance should always be adjusted when the engine is warm.

2 Remove the head cover. Be careful with the bolts, making sure they don't fall into the bilge. They are usually machine threads and are not easily replaced, except by ordering them from the engine manufacturer. Be careful not to damage the head cover gasket.

3 Rotate the motor until the piston of the cylinder you are adjusting is at top dead center on compression stroke, with both valves closed.

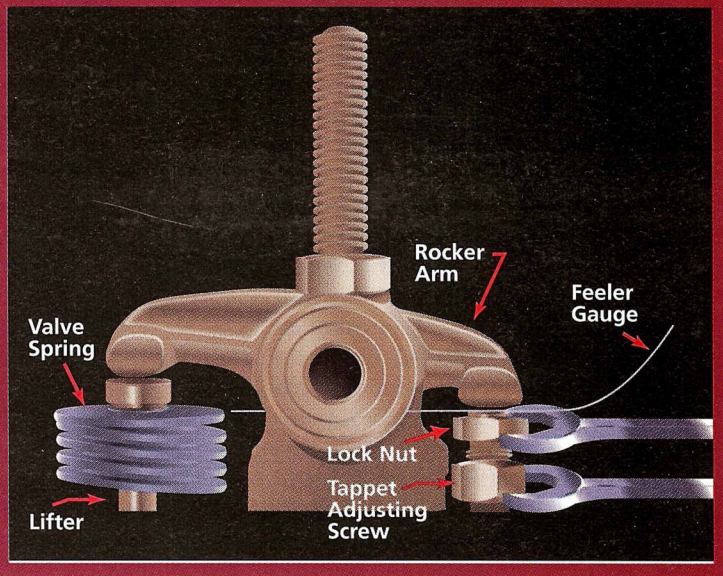
Finding the top dead center position on a four-cycle engine is easy, because the fuel inlet valve opens on a downward stroke of the piston. Both valves then close during the next upward stroke.

In order to find top dead center for any cylinder, rotate the motor until the fuel intake valve is almost all the way down (open). At this point, the piston is at the bottom of the inlet stroke. Put a chalk mark on the flywheel, and then rotate the flywheel another half revolution. At this point, the piston in that cylinder will

KNOW - HOW

Rock On

Adjusting your valves is a relatively simple procedure — and doing it can help you become more familiar with the operation of your inboard engine. Start by removing the head cover, to reveal the rocker arms and valve lifters. Check the clearance of each valve by inserting a feeler gauge between the rocker arm and the tappet. If adjustment of that valve is necessary, loosen the lock nut and turn the adjustment screw until the proper clearance is reached (as measured by the feeler gauge). Tighten the lock nut, then check the rest of the engine's valves using the same procedure.



be at top dead center.

4 Check the clearance on the valves for this cylinder and decide if adjustment is required.

It is not always necessary to adjust all the valves, so I always check the clearance of each valve before I make any adjustment. For instance, if the engine manufacturer states that the valve clearance should be 0.008 inch, then you should be able to slip a 0.008 feeler gauge through the tappet clearance, but you should not be able to slip a 0.009 gauge through there.

5 If adjustment is required: Loosen the lock nut of the valve to be adjusted and turn the adjustment screw until correct clearance has been achieved, as measured with the feeler gauge. See your engine manufacturer's service data for clearance specifications — and the exact procedure, which is usually pictured showing where to place the feeler gauge on your specific engine.

On American-built engines, there are two types of tappet adjusting screws: One is the self-locking type and the other has a locking nut to hold the adjusting screw in place.

Most often, you will find the lock nut type. Its locking nut must be loosened and the adjusting screw or nut must be held in place while it is retightened, after the adjustment is completed. On most American engines, the adjusting screw or bolt penetrates a threaded hole in the rocker arm.

On European or Japanese engines, you will find a number of different arrangements.

For example, the Volvo Penta marine diesel does not have a screw head that penetrates the rocker arm on the side opposite the spring. It has a bolt head that resides on the lifter below the rocker arm, opposite the spring. This bolt threads up from the lifter, and it has adjusting lock nuts on the top of the lifter. The lifter also has two flats to hold a wrench.

6 After you have adjusted the valve clearance and rechecked it, tighten the lock nut.

7 Since you are at top dead center, you can now adjust the other valve on this cylinder, as well — because at this position, both valves are closed. Simply repeat steps 4 and 5 for the other valve.

It makes no difference whether you adjust the intake valve or the exhaust valve first. However, remember that the clearance for the fuel intake and the exhaust valves can differ, so be sure to check and recheck the manufacturer's recommended clearance for each type of valve.

8 Perform the previous four steps for all cylinders, by rotating the motor until the next cylinder in the firing order comes to top dead center.

9 Reinstall the rocker arm cover. If the original gasket is undamaged, it can be reused; if not, use a new gasket. In either case, you'll want to apply a good grade of gasket cement.

10 Torque all the cover bolts to the specification recommended by the manufacturer.

That's it. If you've done all that, you have completed your typical annual engine valve adjustment. You should repeat this procedure every spring or after the number of engine hours recommended by your engine builder.



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