

## Valve Settings

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A couple of list members have asked me about valve setting procedures, Here's how I go about it:

The bike should be cool. Pirsig, In Zen and the Art of Motorcycle Maintenance, writes how he gets up before dawn and sets his valves before the sun clears the horizon and hits the bike. This is a bit anal, in my opinion. The machine just needs to be cool to the touch. Allow an hour or more if this is your first time, with practice, you will get the time down to 20 minutes or so, but, for now, make it a leisurely, unhurried procedure.

Remove the valve covers (you might want to have a pair of cover gaskets on hand as the gaskets can stick, tear or become rock-hard over time). If they are in good, clean shape, they can be left in place and reused. Have something underneath to catch the couple of tablespoons of oil that will fall out when the covers are removed.

Covers off? Now set the engine on Top Dead Center (TDC). Two ways to do this. Remove sparkplugs and set aside. Remove rubber timing cover plug on left (rider's left) side of engine. Then, either: 1. Place in second gear and bump engine around using the rear wheel or 2. remove front points cover (disconnect battery ground strap!), place allen wrench in alternator/end of crankshaft and turn engine. What you are looking for is for the flywheel markings to appear in the timing hole on the left side of the engine. A good strong flashlight often helps visualize the marks. "OT" and a short line is what you are looking for. Line the line with the center of the hole. You are now on TDC on one side of the engine. Which side? One side will be really be bound up, with no play in the rocker arms and the push-rods will be tight and unable to be spun around, the other side is TDC. There should be some play in the rockers and the push-rods should have some looseness on the TDC side.

If this is a BMW that you have been servicing for a while, there hasn't been any work done on the heads recently and you have torqued the heads several times, the last time being fairly recently; you don't need to torque the heads everytime you set the valves. Let's assume this is not the case.

I loosen one rocker arm's hold down nuts just enough the allow the rocker to move. Then you want to take up any up and down clearance in the rocker arm and mounting blocks. This looseness is basically harmless, but creates noise in the valvetrain. On /5s and /6s (up to 1976) you have to do this, later bikes have a centering system in the rocker arm mounting design - I still like to take up the clearance anyway. There are two ways to do this: Using a large set of water-pump slip pliers to squeeze the assembly or a C-clamp with a couple of sockets of a size sufficient to clear the top and bottom of the rocker shaft. While the assembly is loose, center the rocker arm end over the end of the valve stem, squeeze and tighten the hold down nuts. You don't want to grunt down on the assembly, just enough force to take up clearance. Using a torque wrench, tighten down the two nuts to the recommended torque ( for steel-sleeved BMW cylinders, the value is 27-28 ft.lbs., for NikaSil, post 1981 BMWs, it's 24-25 ft.lbs.). Break loose and retorqued the two center nuts, at 12 o'clock and 6 o'clock. Repeat with the other rocker arm assembly on that side. You are now ready to set clearance. The adjuster nut and adjuster are both 12 mm. Check with a feeler guage before loosening anything, you just might be having a really good day and the clearance will be right where you want it without any adjustment required. The exhaust valve is the one closest to the header pipe and the intake is the one closest to the carb (hey, people ask). What clearance to use? I use a standard of .20mm for the exhaust and >15mm for the intake. A 1976 or later bike ( or a retro-fitted /5 or /6) will have alloy rather than steel pushrods and needle bearing rocker arms; you MAY be able to go a little tighter on these models. That's one of the many reasons to learn to do your own valve setting, you will get real acquainted with your beast and how it operates. But, I would start out with the .20 and .15 settings at first. When setting the clearance, adjust for a feeling of moderate drag when you slide the feeler in and out between the valve stem and rocker arm. Check again after you tighten the adjuster nut. Sometimes the clearance will open with tightening, sometimes it will close up and sometimes it stays the same. This is your bike, get to know how it reacts to your hand. Clearance OK? Reinstall the valve cover on that side (careful with the 13mm chrome nut in the center of the cover - that stud is the most commonly stripped fastener on the bike).

Turn the engine 360 degrees (one full rotation) until the "OT" mark reappears. You are now on TDC on the other side of the engine. Repeat the above for that side.

That's it! If your BMW is new to you, I would do this every 2000 miles for two or three times so you can get to know if the valves change in a pattern. If they are seriously tight each time, you probably have a recession problem and the time is coming for a top-end rebuild, using leadfree seats and guides. You may find there is little change at all, so you can start to stretch out the intervals between valve settings. "I just carefully set the valves and it seems noisier now than before" This is a fairly common complaint, on higher milage machines. This could be related to the following: On a fresh engine the circle of contact between the valve and the valve seat is a circle that is fairly narrow. As the engine wears, this circle

get thicker. There is a maximum thickness that is specified ( I don't have the numbers at hand). The engine can run, quite well, at full compression, under this condition but the smacking of the valve to seat in this wide area of contact will set up a resonance that is noisy. If the valves have tightened up a bit, this can quiet things down. Then, you go and set the clearance and open things up a little. More noise! This really is not a reason to do a top-end job but is a sort of early warning that the time is approaching. I hope this is helpful to those who queried me about setting valves. Looking after one's valves and changing your oil often are the two most important factors for long, healthy engine life.