Checking Valve Clearance on a K1100LT

After all the horrible stories that I have heard about folks getting surprised when they take their bikes in for a valve adjustment, my curiosity got the best of me and I just **had** to know how many of my valves where out of adjustment.

If you have recently had a valve adjustment done and can send me information about the cost of the work, or use the mail link at the bottom of the page.

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Tools and Preparation

- Tools
  - #2 Phillips Screw Driver
  - Small regular screw driver or stiff wire
  - 13 mm socket
  - 10 mm socket
  - 13 mm open or boxed wrench
  - Extensions
  - 5mm hex
  - 6mm hex
  - Feeler gauge set

Here's a conversion table. Make sure your set contains the range below. Some cheap sets do not.

  - Gasket Sealer
  - Rags
  - Cardboard or plastic for the floor

- Preparation

1. The adjustment must be done stone cold. I believe the manual says 95F maximum. - *Bryan Lally*
2. Haynes says the maximum head temperature is 68 degrees Fahrenheit. I think this is unrealistic. This would mean you could not set the valves in many areas of the US during a summer day. Clymer's says maximum allowable cylinder head temperature is 90 degrees Fahrenheit and this sounds about right. - *Brian Curry*
3. After the last ride before I plan on checking the valves, as I park the bike, I pull into the garage and turn the engine off. Then I lean the bike to the right and hold it for 30 seconds or so. As far to the right and for as long as I can manage. Then I put it on the center stand without putting it on the sidestand or leaning it to the left. This gets almost all the oil out of the valve cover, reducing the dripping mess considerably.- *Bryan Lally*

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Stripping Down to the Valve Cover

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1. Remove the left side body panel cover over the fuse area.
   - Rock the rear of the cover while pulling out, to pull it off the rear pin.
   - Slide your hand up under the center of the cover, palm toward you, until you can feel the attachment point of the little arm which is bonded to the cover and exert pressure with your finger tips, away from the bike to pop the yoke away from the mount.

Once you have seen he rear of this cover, you will understand why so many of them have been broken, and why it is necessary to be careful with them.

   - Pull the cover out, then to the rear to remove it.

2. Remove the left side panel and fuel gauge.
   - Remove the single machine screw in the center of the panel.
   - Remove the two screws inside the radio cover latch area.
   - Pull off the cover and unplug the fuel gauge wire.

3. Remove the radio pocket

Don't remove the radio out of the pocket with the pair of "forks". It's much easier to spring the whole radio chassis out of the pocket, then remove the pocket itself. Also, there is no need to re-enter the radio code.

   - Spring the clips through the three, 4 mm round holes. The three holes are on the outer facing of the radio flange. *(stiff wire, or small screw driver)*

- The holes are at 12, 9, and 6 "o'clock"
- Pull the radio up and place it on a pad on the handle bars covering the key area and switches.
- Remove the two phillips screws on the front inside of the pocket, and raise the pocket up.
- Put the radio back in the pocket and lay the pocket holding the radio back up on the padded area.
- Tie it down with a bungie. Mine almost slid off.

4. Remove the left side crash bar. *(13 mm socket, 13 mm open or boxed end wrench)*
   - Pull out on the plastic cap in the end of the upper mount tube.
   - Remove the 13 mm nut inside the tube. You will need a deep socket or an extension to reach into the tube.
   - Remove the two 13 mm nuts on the lower studs. The rear one has a braided ground strap. Be careful not twist the strap and break it. (Don't ask me how I know this)
   - Pull the crash bar off the three mount studs.

5. Remove the left side lower fairing.

It is helpful in this step to figure some way to remember which screw goes where. I wrote a description of the screws on paper, as well as laying them out on the floor in the order and shape of the lower fairing, so that they would not get mixed up. There are ***several*** *different types and lengths of screws holding the lower fairing on.*

   - Remove the machine screw from the back, inside of the fuel gauge area.
   - Remove the screw from under the rubber mount at the lower rear.
   - Remove two screws from lower front.
   - Remove four screws from the backside, behind the fork tubes, where the radiator grill is located
   - While supporting the lower fairing with one hand, unscrew the three anodized screws under the radio pocket area.

The fairing will fall off into your hand when you loosen the last of these three screws, so catch it!

6. Remove the 10 mm bolt securing the mount arm on the rear, top of the head. This arm accepts two screws via body clips, below the fuel gauge. Don't let the clips get away.

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*The BMW manual strongly tells you **NOT** to remove the spark plugs before checking valve clearance. The reasoning is that carbon from the plugs or threads could wedge under the valve seats and give a false reading.*

1. Remove the four hex bolts holding the spark plug cover. *(5mm Hex Wrench)*
2. Stuff a rag in the area of the spark plug wire caps. This will catch any oil that drains down from the upper, intake valve side of the head casting.
3. Loosen eleven round headed hex valve cover bolts. Some will come out all the way, while others will remain in the cover. *(6mm Hex Wrench)*
4. Place a pan or some cardboard under the valve cover.
5. Bump the cover with your fist, while pulling it away from the head.
6. The valve cover should almost drop off when you remove the bolts. Use a soft rubber or plastic mallet if it will not. Or tap it using the wooden handle of a conventional hammer. If it is stuck, make sure you have all the bolts off, you have probably missed one. (DAHIK) - *Brian Curry*
7. Wiggle the cover off the head being careful not to tear the rubber gasket.
8. When you do this, it is good to have a spare set of new valve cover gaskets available. This scares the old gaskets into submission and they will not hurt themselves and need replacement. ;);) - *Brian Curry*
9. Locate the grounding spring on one of the posts inside the cover area. It should stay on the post, but it you don't see it, find it.

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Checking Intake Valve Clearance
The Top Cam

1. Shift the transmission into 5th gear.
2. Get a paper and pencil. Make a drawing on the paper to correspond with the valves so that you can write down two numbers for each valve.
3. Disconnect the coil wire at the distributor cap and ground it to the engine somewhere. - *Mick McKinnon*
4. Rotate the rear wheel counter clockwise (as if the bike was traveling forward) until the one set of lobes points directly away from the buckets.
5. The valve stems are splayed outwards away from the sparkplug cavity. So when the cam lobe is 180 degrees out (opposite) the valve stem, (the measurement position) it will be pointed somewhat up or down and not simply "out". - *Brian Curry*
6. Starting with 0.127 mm, slide the feeler gauges between the cam lobe and the bucket until you find the size that will **not** go under the cam lobe.
7. I found the feeler gauges can be inserted to check the clearance most easily from the spark plug cavity direction. - *Brian Curry*
8. Write down the two sizes for each lobe, the one that will go under, and the one that won't go under.

If 0.127 mm will not slide under a lobe, the valve is tight, use successively smaller ones until you find one that does go under. The clearances for the intake valves should be between 0.150 mm and 0.200 mm.

9. Continue rotating the rear wheel to bring up a set of intake valves, and then measure to get the two reading for each of the eight valves.
10. When you finish you should have eight pairs of numbers. Here are mine.

	1A	1B	2A	2B	3A	3B	4A	4B
YES	0.152	0.152	0.152	0.152	0.178	0.127	0.152	0.152
NO	0.178	0.178	0.178	0.178	0.203	0.152	0.178	0.178

11.
12. Your valve clearance is somewhere **between** these two numbers.
13. By looking at the above numbers, numbers 3A and 3B could be in need of adjustment. 3A could be loose and 3B could be tight. So far, so good, but exhaust valves may bring some bad news.

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Checking Exhaust Valve Clearance
The Bottom Cam

1. Follow the steps for the intake valves, except the clearance for exhaust valves is 0.200 mm to 0.300 mm

	1A	1B	2A	2B	3A	3B	4A	4B
YES	0.229	0.178	0.254	0.229	0.305	0.279	0.279	0.330
NO	0.254	0.203	0.279	0.254	0.330	0.305	0.305	0.356

2.
3. Looking at the above, number 1B is tight, 3A and 4B are loose.

Bad news. Three exhaust valve buckets need to be changed. With the two intakes that are close, I need a total of 5 buckets. At $22 each, I need $110 worth of buckets.

To change the buckets, the cams have to be removed and it takes several special tools to do this. I don't know how many shop hours it takes to do the adjustment, but after I take the bike in, I'll add the info to this page.
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Reassembly

1. Clean the valve cover and the head surface completely of oil. I used kerosene and mineral spirits on the valve cover, because it is painted and my standard solvent for gasket prep, lacquer thinner, might have taken the finnish off the cover. I wiped down the head surface with lacquer thinner .
2. Clean the rubber gasket of sealant. It took me over an hour to remove the sealant off the gasket. The manual says to use Threebond 1209, which I could not find, so I used Permatex high temp black sealant.
3. Place the cover, gasket side up, on the ground or a table and insert the gasket into the cover. The gasket has a "T" shaped cross section, and the base of the "T" inserts into the valve cover.
4. Align the index marks in the "half moon" projections in the rear of the cover, with the index marks on the gasket.
5. Don't use sealant between the gasket and the cover.
6. Work the gasket into the channel toward the front end of the cover.
7. Place a light coat of sealant over the "half moon" projections, and be sure to cover the corner where the projections connect with the flat part of the gasket. (I spooged the whole thing)
8. Make sure the grounding spring is on the post and put the cover back on the head.
9. Insert the eleven round head hex bolts and run them down, but don't tighten them.*(6mm Hex Wrench)*
10. Starting from the center, and working in a criss-cross pattern, tighten the bolt to 8 newton-meters. (Which is not much, so have the right torque wrench)

The valve cover gasket compression is preset. It cannot be "snugged down" greater than the amount allowed by the *shouldered* bolts. (The shoulder, not the gasket causes the resistant to tightening.) When they are "snug" they are as tight as they are going to be. Tightening them more will not squoosh the gasket. It will pull the mounting threads out of the cam shaft pillow blocks. This is not a good thing. If you pull the threads out, it is new head time, as the cam shaft pillow blocks are linebored. IMO, I think the "factory torque value" for these fasteners is too high. If the cover is leaking, figure out what is caught in it, or get a new one, or try putting some silicone caulk/seal on it. - *Brian Curry*

11. Follow the reverse order of disassembly until you have it all back together.
12. Let the bike sit overnight for the sealant to cure.
13. Call Pat Roddy and meet him at the local Harley Dealer.

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Comments From Others

- *Scott Lee*
  - Gasket sealer goes at the upper-left corner and near the half-moon gaskets.
  - Grave warnings not to over-torque the valve-cover retaining bolts are in order. The result of stripping out a valve cover bolt are:
    - Leaky gasket if bolt strip not repaired.
    - Helicoil/keyinsert to repair, if repairable.

        - NEW HEAD if not repairable, as the cam retaining blocks/saddles are aligned bored with the head and are NOT interchangeable.
    - The way that works for me (no leaks) is to use a 1/4 inch drive ratchet (small handle, less torque transmitted, better "feel"), and "tighten firmly, but not too firmly" after feeling the bolt bottom out. Same method (and warnings..) for the crankcase cover apply, BTW. Even though I am a firm believer in using a torque wrench, the cost/availability of quality torque wrenches that read that low is questionable, and if the torque wrench reads wrong or doesn't "click", you can be in a heap of trouble quickly, especially the novice mechanics that will be using the FAQ as guidance (remember your audience).
    - Your instructions are obviously for a 16 valve LT. Leaving out the bodywork removal tips would probably be OK.
    - Metric measurements-MANY people use english unit feeler gauges, so including those numbers would probably be a good idea.
    - The gaskets are good for 2 or 3 uses, then will need replacing, WITH the rubber buttons on the bolts and half-moons. Rubber buttons are best removed from the bolts with a pair of "diagonal wire cutters" (AKA dikes).
    - Well, how do you adjust the valves?? Several expensive special tools to remove/replace the cams, etc.?? What exactly does it take? If its' $150.00 in special tools, and a 3 hour labor hit, the tools pay for themselves the first use (assuming zero value for your time). Shim measurement and the tools required (micrometer vs. dial calipers, etc.) might also be a discussion area...

- *Graham Smith*
    - Most BMW dealers have an EXCHANGE service for the shims. New shims here are AUD$30.00, exchange is $8.00. I needed 8 shims after shuffling around what I had because ALL of my valves had been lapped in after the head service.
    - "In the know" tip #1: If you have to take the head off, you can check the clearances BEFORE you put the head back on the bike. This way if you have a clearance that's too small, you can remove the valve and polish off a bit of the valve stem top until you have correct clearance, saving you a shim.
    - I didn't think I needed ANY special tools. Albeit I have a well stocked tool box, but I didn't need anything more special that a GOOD set of feeler gauges and a torque wrench.
    - I have been advised by "People in the know" NOT to use any sealant on the rubber gaskets except for the "T" or the "Cross" as it is known, where the timing case meets the head, and a little on the 1/2 moon parts. Otherwise NO SEALANT AT ALL is required. Suggested sealant is Wurth super silicone. (The RED stuff)
    - Warning - Do NOT do any of this if you are not familiar with timing gear and it's assembly or disassembly. If you get it wrong you will have valves putting holes in pistons where there were none before.
    - You have to remove the cams to change a shim. The "Special Tool" and "Cams in head" replacement is for K100 ONLY. To remove the cams, you have to remove the crankcase cover and timing chain cover. Turn engine over until you are at firing

position TDC number 1 cyl. Then remove timing chain tensioner and cam sprockets. This will allow you to remove all the cam retainers & cams and start to change shims. Use a magnet to remove the shims from their guides. Use Engine Assembly Grease (MolybdinumDisulphide+Graphite) smeared around the OUTSIDE of the shim when installing and also all over all cam wear surfaces and head bearing surfaces. Install cams, attach sprockets, install tensioner, turn engine over by hand a few times and repeat entire process until you run out of patience or correct clearance shims and give it away until next weekend. At that rate it's taken me 5 weeks to put the covers back on...

- *Richard Cliatt - wrench @ Global Imports, Atlanta*
  - Valve adjusting buckets should not be swapped around or re-used because of the wear pattern develops on the bucket.
  - Throttle bodies should be balanced after a valve adjustment because changing the amount of opening of the valve, changes the volume of air flowing through them.

- *Brian Curry*
  - I use a "Go-No Go" measurement technique. I find it easier than knowing I have the correct amount of feeler gauge drag, or what a "firm push/pull" is. For a measurement of 0.007" I would use three gauges: 0.006", 0.007", 0.008". The 0.006 should go through with virtually no drag. The 0.007 should go through with some drag. the 0.008" should not go through at all. The result is that the clearance is 0.007" This has worked fine for me for over 200K miles of R bike service. In a "measurement mode" I find the gauge that is blocked. I then check that the next lower gauge thickness will push through and the two thicknesses lower gauge passes easily. So, if 0.010" is blocked, 0.009" pushes through, and 0.008" passes easily, the clearance is 0.009".

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Conversion Table

- inch - mm
- 0.005 - 0.127
- 0.006 - 0.152
- 0.007 - 0.178
- 0.008 - 0.203
- 0.009 - 0.229
- 0.010 - 0.254
- 0.011 - 0.279
- 0.012 - 0.305
- 0.013 - 0.330
- 0.014 - 0.356

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