

How to inspect the valves on a KTM LC4... In three easy steps.

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Having recently been asked, by both absolute beginners as well as skilled individuals, the process for inspecting/adjusting the valves on the LC4 engine; I decided to write this guide.

As an ex motorcycle technical writer and instructor, I take great satisfaction in someone performing a complicated task, successfully and for the first time, with nothing more than my written instructions... and maybe the occasional poke in the ribs. 🤪

I have written the steps to this process individually several times, but have never put it all together in one bite, until now.

This has been written for someone that has fair to good mechanical aptitude.

If you're reading this with intent... and you've never spun a wrench, you are a brave soul. 🤖

If you can take your bike apart and put it back together... and it still runs, you may find this mildly entertaining, but by no means, new information.

Part One. Getting there.

We will use the 640 Adventure as our example, as it is the most complicated to "field strip" model of LC4, and the one I happen to own. It is also the model that most of the folks reading this, will own as well.

If you own an SXC, SMC or LC4E... the vast majority of this information still applies, you simply have fewer parts to remove and reinstall. Lucky you. 🏰🤪🏰

No doubt there are some variations from year to year, but I don't believe they will be too much of an issue.

Some of the information provided is basic 4-stroke theory & design, and may apply to brands and models other than KTM.

Tools & Parts

1. A Motion Pro valve lash feeler gauge (.006" or 0.15mm) or reasonable facsimile.
2. A set of metric Allen wrenches. You may find it necessary to "cut down" the short end of a few of your Allen wrenches to improve access to some fasteners. As an alternative to cutting down Allan wrenches, if you have a small 1/4" ratcheting wrench and short metric Allen insert bits... much like cut down Allens, they can really come in handy on some of the limited clearance rocker cover bolts.
3. A set of metric Allen sockets, preferably 1/4" drive.
4. A set of metric sockets, again, preferably 1/4" drive.
5. A 1/4" drive ratchet and extension assortment.
6. Miscellaneous hand tools such as screwdrivers, pliers, band-aids and so forth.

7. I'm not going to list a torque wrench because most folks don't own a " torque wrench, let alone the more preferable but not so easy to find 1/4" torque wrench.
8. New rocker cover gaskets (yes, you can reuse the old ones, once... if they are in real good condition)
9. Now would be a good time to consider replacing the spark plug if it has 5K miles or better on it.
10. Some Zip-ties in assorted sizes.

Why a 1/4" drive set rather than the more common " drive? The third rule of professional mechanics is "use the smallest tool that will reasonably do the job". Most fasteners on the LC4 engine are small and have relatively low torque values, there are no fasteners on this job that require using the larger, bulkier... and with greater potential for "excessive leverage"... " drive set.

Proper Atmosphere

That's right... atmosphere.



What I mean is, a well-lit and relatively clean environment where you will not be distracted or disturbed. A separate clean space away from where you will be working, to safely store the parts that you have removed.

Nothing more entertaining than turning around suddenly, startled from your dog chasing your cat thru your tools, and kicking your gas tank across the room... or, if the tank was full, breaking your big toe so badly... you need morphine. 🤪

Drifty has suggested some laid back tunes... like old blues or, if your like me, maybe some Emmylou Harris. The idea being that you will have less a tendency to throw things or try to put a pipe wrench into your cylinder head. 🤔

Disassembly

I will not waste your time outlining the details of things like tank or fairing removal... if you can't do these tasks, you may want to take your bike to a Dealership or a trusted and mechanically inclined friend... with a copy of this guide.

Is your motorcycle clean? If not, after removing item four... you may want to give the engine compartment a little bath. Don't want big chunks of dried mud or little rocks falling in your motor... do you?

Is your motorcycle engine at room temperature? Don't perform this task 45 minutes after riding into the garage. It takes several hours for an entire motorcycle engine to cool to room temperature.

You will need to remove the following parts from the motorcycle.

1. Seat. (One bolt)

2. Outer fairing (Six bolts. two turn signal electrical connectors)

3. Fuel tank. You do not have to remove your inner dash, but it helps to get it out of the way for tank removal. Use tie straps or elastic cord to tie the “ears” of the dash up to the handlebars. (One nut. three fuel hoses. one vent hose, if any)

4. Cooling fan. Don't force it; it comes out easy once the back tabs are popped from behind the radiator. (Two screws. one electrical connector)

5. Front rocker cover-to-frame vent hose. (Two screw clamps)

6. Rocker covers. Save the covers as the next to last parts you remove or disconnect. (Three screws each... watch the washers)

7. Spark plug. Save this as the last part you remove or disconnect. If you have a compressor, blow out the plug recess thoroughly prior to pulling the plug.

8. It is not necessary to remove the radiators. It does make access a bit easier, but it is a trade off in time and hassle.

You will need to partially remove and hold away the following parts from the motorcycle.

1. Coil (one bolt)

2. De-compressor cable (back off adjustment and disconnect from lever... you can leave the cable attached to the front cover or remove it... your choice)

3. You may need to snip a zip-tie or two along the way, to move a harness or cable out of the way.

4. See items 6 and 7 above.

5. At this point, you should have more than adequate access to the four rockers and their adjusters. If not, one of us has forgotten something and it might not be you, because... Yes, I am doing this from memory. 🤖

That's it... on to part two.

Part two. Finding TDCC

A great deal has been written in this and other forums about finding TDCC. Some descriptions are quick and easy, written by and intended for people who have a good grasp of how a 4-stroke engine works.

Other descriptions, written by some well-meaning folks who undoubtedly think that the “factory service manual” was handed down to Moses... along with the Ten

Commandments,  are simply parroting that material. It's not necessarily wrong; it's just painfully slow and amateurish.

First, don't worry about finding exact TDC-Compression (top dead center-compression).

Both intake and exhaust valves must be closed for several degrees before and after TDCC, otherwise there would be no compressed mixture to ignite... and consequently, no power stroke.

A four-stroke engine's intake valves open a few degrees before TDC-Intake, at the end of the exhaust stroke, and close several degrees after the BDC-Intake, which is the beginning the compression stroke.

The "Easy Way"

When you have taken off enough parts to see the rocker arms and valves, do as follows:

Elevate the rear wheel, make sure you have removed the spark plug and then shift the bike into 5th gear. Rotate the rear wheel in the forward direction a few revolutions, and watch the rocker arms open and close the valves... see how that works? 😊

Disregard the auto de-compressor "clack"... it won't hurt you... 

Turn the rear wheel very slowly, right after the intake valves open, then close... STOP! OK, good so far. You are now somewhere after BDC-C (bottom dead center, compression) and approaching TDCC.

Put a soda straw in the spark plug hole until it rests on the piston, slowly turn the rear wheel and watch the soda straw rise up the plug hole. At this point, if you want you can use a focusing flashlight to actually see the piston rising in the cylinder on it's way to TDC.

If you overdo it, and go past TDCC and the piston starts to go back down, simply turn the rear wheel backwards a bit.

Weather you check the valves a bit before or a bit after TDCC is no big deal, as the valves are closed for several degrees both before and after TDCC.

Once you are near TDC (about ?" to ½" from either side of TDC is just fine) you can go ahead and check your valve lash.

I hope this all makes sense to you; it is actually allot quicker to do than it is to describe.

It's nothing more that rotating the engine to a position where all the valves are closed... the position of the piston is being used only as a point of reference relative to the valve train.

When you reach the point where the rocker covers are off and the plug is out... it

takes about 30 seconds to do the rest... honest. 🚧🔧

Part Three. Inspecting/adjusting valve lash

What you are checking is the clearance (lash) between the rocker arm threaded adjuster pad and valve stem tip.

It should be .006", cold. Too much, and you have noise, the potential for damage and a reduction in cam timing duration with the subsequent loss of power. Too little, and you have the potential for damage.

This is where the right feeler gauge comes into play.

To do this job as quickly and easily as possible, you should have the right feeler gauge; the Motion Pro design is the best and only way to go, unless you are a cheap bastard like me, and want to make a "copy" of the Motion Pro.

The Motion Pro gauge has a stiff metal "handle" about 3 inches long and a short (about 1/2") narrow blade riveted to each end, bent at about a 90° angle. (You will want to readjust the blade to a "less severe" angle)

How do you make a valve lash feeler gauge? Easy. Simply take a .006" feeler gauge blade and epoxy it between two thicker blades to make the handle, with approximately 1/2" of the .006" blade extending past it. Put about a 45° angle on the blade and your ready to go.





The idea is that with the space you have to work in being very "limited", the stiff handle offers more control and eliminates blade flex and bending... problems associated with a conventional feeler gauge blade.

Doing it ... What Meat refers to as "The Moment of Truth" 🤖

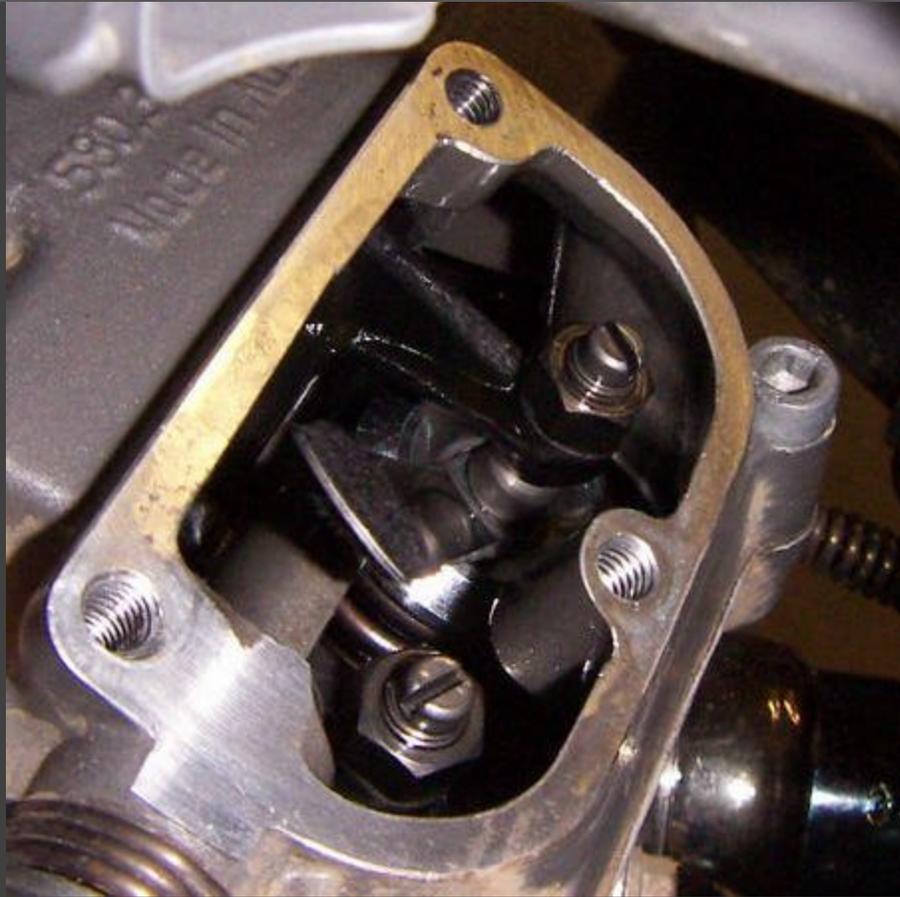
When you first insert the blade into the clearance between pad and stem tip, it may take an unusually high bit of effort to do... ignore this, and pay attention to the "feel" of the blade after insertion... a bit of drag, or resistance on the gauge is what we are looking for.

Slide the blade back and forth a bit to get a feel for the resistance, It should be like... how to describe feel... Do you have a roll of scotch tape? Slowly pull some tape off the roll... feel the resistance? Kinda like that. 🤖

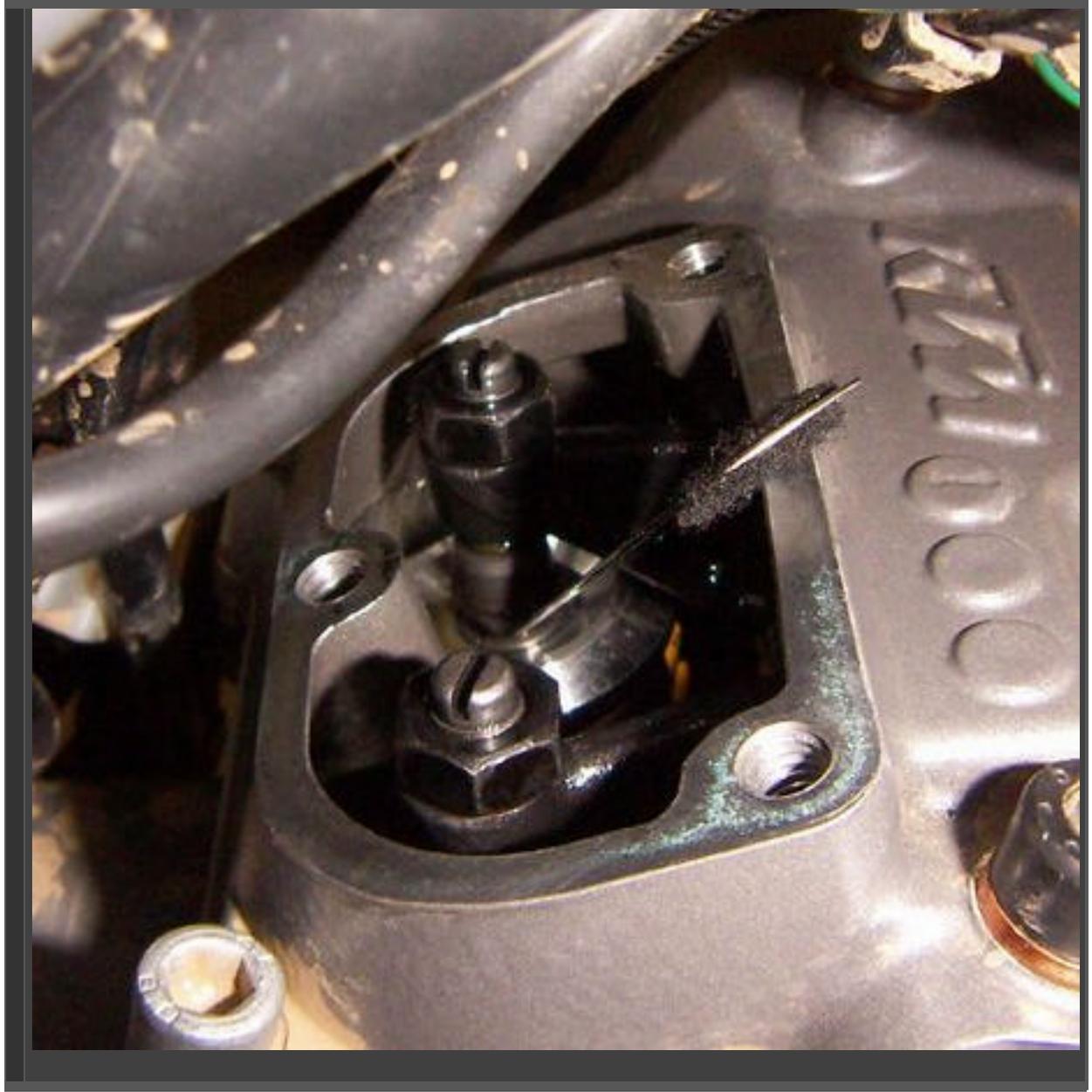
If you find that it requires a bit more effort than described in the tape roll analogy to move the blade back and forth, you have a "tight six"... closer to a .005" clearance. If you can slide it back and forth easily, with only slight resistance you have a "loose six"... closer to a .007".

When I have either of the above described "feels", I call it good and record my clearances for future reference and to track any valve clearance "trends".

If your feel goes beyond the described limits, then it's time to readjust the lash to within specification.



If you need to make an adjustment, even if it's only on one valve, you will want to loosen both jam nuts. I've found that due to the rocker arm's clearance on its shaft, the adjustment and feel on one valve can affect the other... besides, if you're reading this, you could probably use the practice. 😊





When you loosen the jam nuts, unless you have the previously mentioned $\frac{1}{4}$ " drive torque wrench, you will want to note the effort required to do this as you will attempt to replicate the original torque value by feel. 🤖

If you do have a $\frac{1}{4}$ " torque wrench, find an easily accessible fastener of the same size on your bike and torque it to 12 ft./lbs., now lay a wrench on it and get a feel for that value. When you re-torque the jam nuts, try to duplicate that value by hand.

Something you will notice is that when you re-tighten the jam nut, the lash actually loosens slightly, this is from the nut pulling the adjuster stud hard up against its threads.

You will undoubtedly tighten and loosen the jam nut several times, checking the feel each time... This is fine; I do it myself every time I have to make an adjustment.

When it feels right, and the jam nuts are “torqued”... and it still feels right...

Congratulations!!! 🙌 You're almost done. 🎉

You can still do this job with a regular feeler gauge blade if you so choose, but it is very difficult if not impossible to "check" the clearances. I have done it both ways and prefer the “check” method to the “mandatory” method.

About all you can do is back off the adjusters, place the conventional blade into the excessive gap and run the adjusters down onto the blade, check the feel and tighten your jam nuts. 😊

Almost home

Once the valve seats and valves have "broken in", (a few thousand miles) the adjustment doesn't change much... it's much quicker to check the clearance with the Motion Pro gauge or homemade version than a mandatory re-adjustment of the clearance every time.

Give yourself lots of time to do this task if it's your first time. Double, triple check everything as you go, be methodical and orderly... you'll be fine. Once you've done it a few times, you will find the entire process can be performed in a about an hour... give or take.

I seldom rush. What is the carpenter's first rule? Measure twice, cut once.

When putting everything back together, simply reverse the steps. Don't over torque any fasteners and don't forget to install new zip-ties where needed. A bit of light grease on the four round tank rubber mounts help the tank to slide into place a bit easier.

When you light it off after finishing, and everything sounds as it should, have a cold one, give the dog and cat a treat for not getting in your way and give yourself a pat on the back for a job well done. 🙌

Chris 'Creeper' Hickson

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