

# Pictorial Installation : Schnitz 685cc piston kit for Kawasaki KLR650

## Part 1: Disassembly

by: JeremyZ

Note: This pictorial was conducted on a non-California, US model 2009 KLR650. On California and Australian models, there are slight differences, which are pointed out in the manuals. When I refer to "right" or "left", I mean as you sit on the bike.

- 1) Buy the piston kit and a service manual. I bought both the factory and Clymer manuals. I compared the manuals for the first few steps, and found that I greatly prefer the Clymer manual. It seems to have been written by a human being instead of a robot, and warns the would-be mechanic of any pitfalls ahead of time. new factory gaskets. (head gasket, cam chain tensioner gasket)



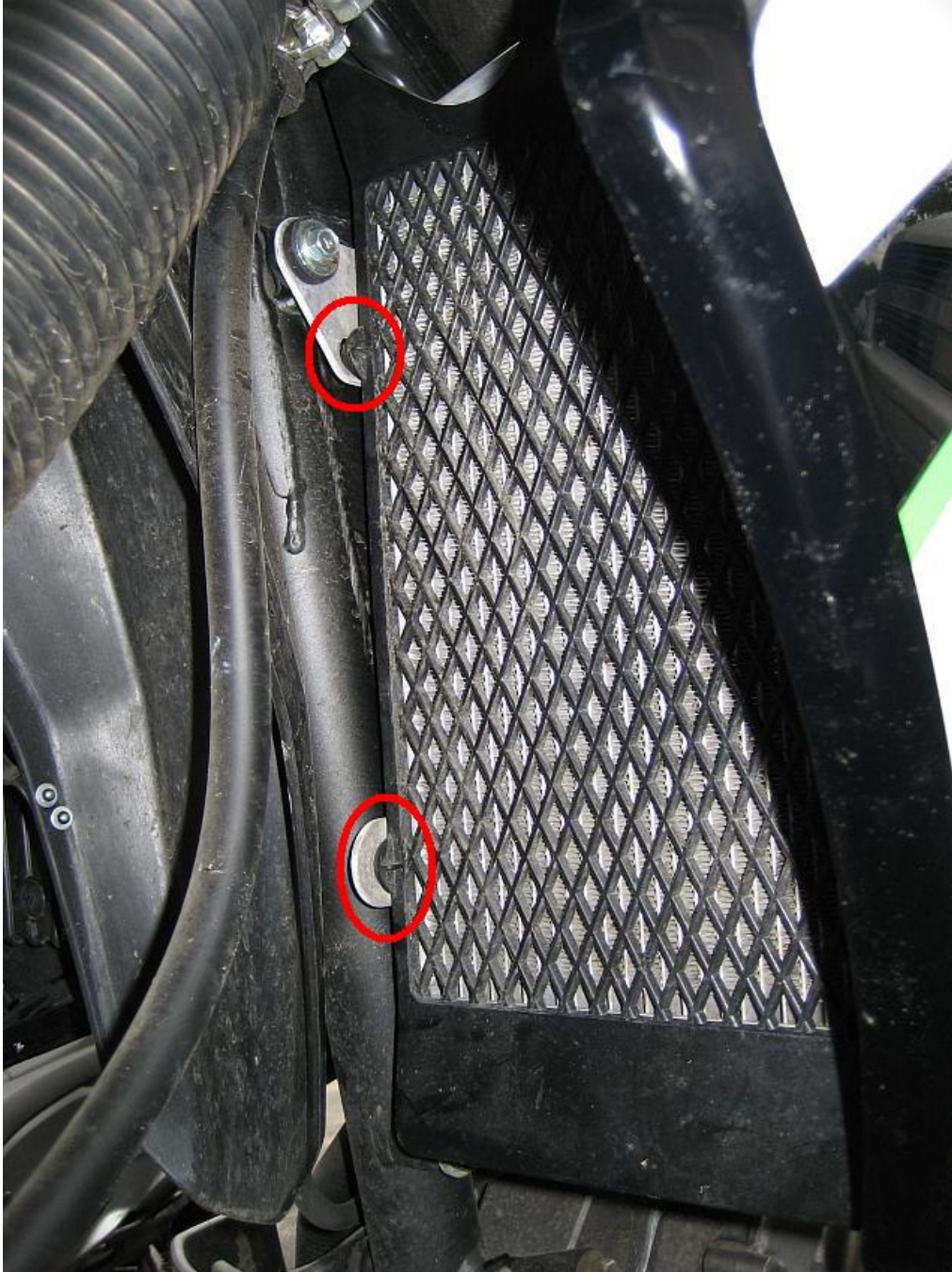
- 2) Remove the side fairings. This photo shows two of the three bolts that must be removed.



Here's the third bolt. This photo is looking up at the underside of the fairing, next to the left fork tube. (left as you're sitting on the bike)



When that last bolt, note that this bolt also holds on the grille which covers the radiator. The grille has two nubs on the left side (as you look at it in this photo) that fit into holes in the radiator mounting flange.



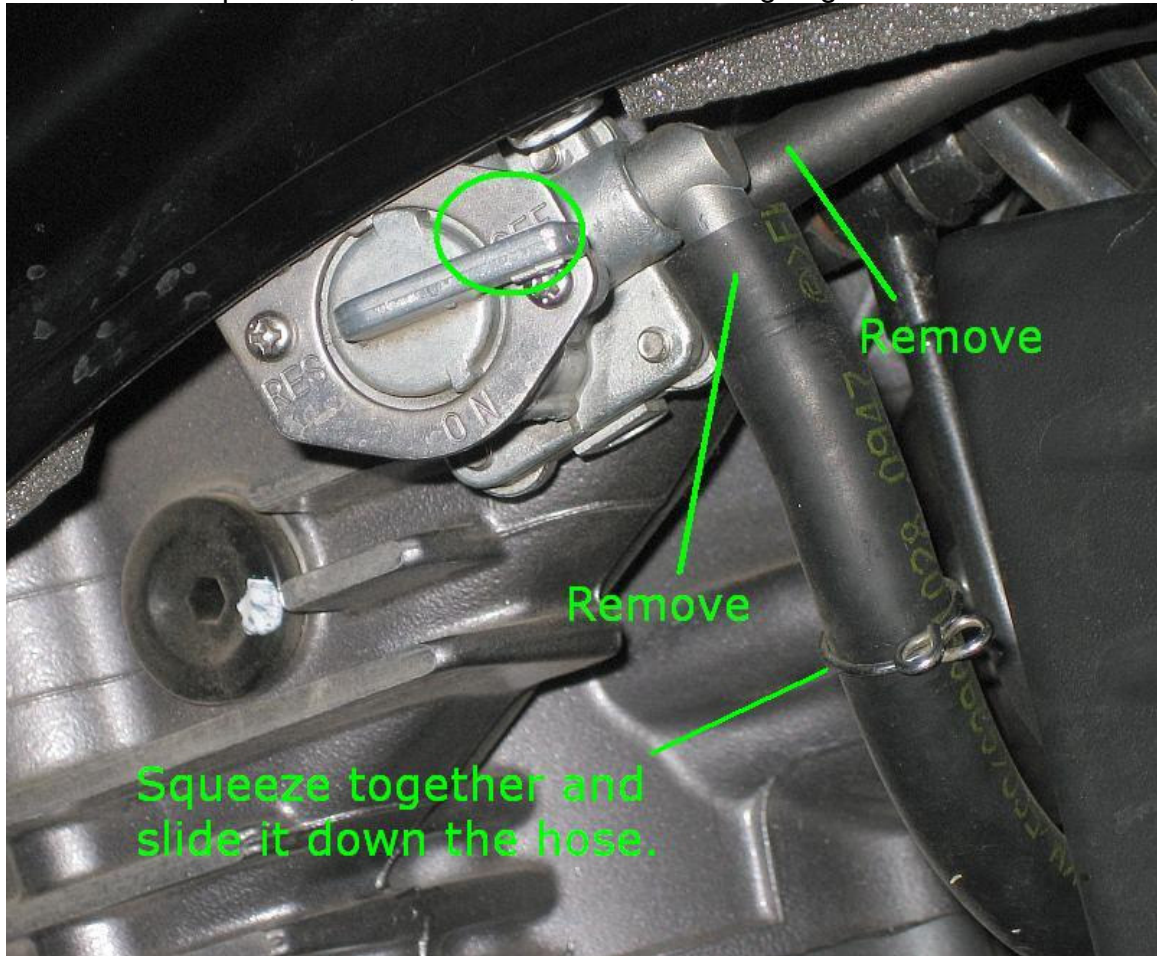
Repeat the same thing on the other side. The outside bolts are in the same places. The inside one is a little higher, and really tucked under there:



- 3) Take off the side covers, near below the seat, on each side. In the photo below, the red circles show the bolt locations that hold on the side cover. The blue circle shows where the side covers snap in at the bottom. The green circle shows the bolts that holds the seat down. These locations are the same on the right side of the bike. After you remove the seat, also disconnect the negative battery terminal, which is also visible in the photo below. If you don't, there is a high probability you will accidentally short it out later.



- 4) The next step is to pull the fuel tank. (See pg. 3-26 in the factory service manual)  
Turn the fuel tap to OFF, then remove the two hoses going to it.



- 5) After turning off and disconnecting the petcock, remove the drain hose (green) and the fuel tank bolts (pink) these are 10mm. Then, lift up a bit and gently slide the tank backwards off the frame. Put it somewhere it won't get knocked over. It will sit on its own without damaging the petcock.

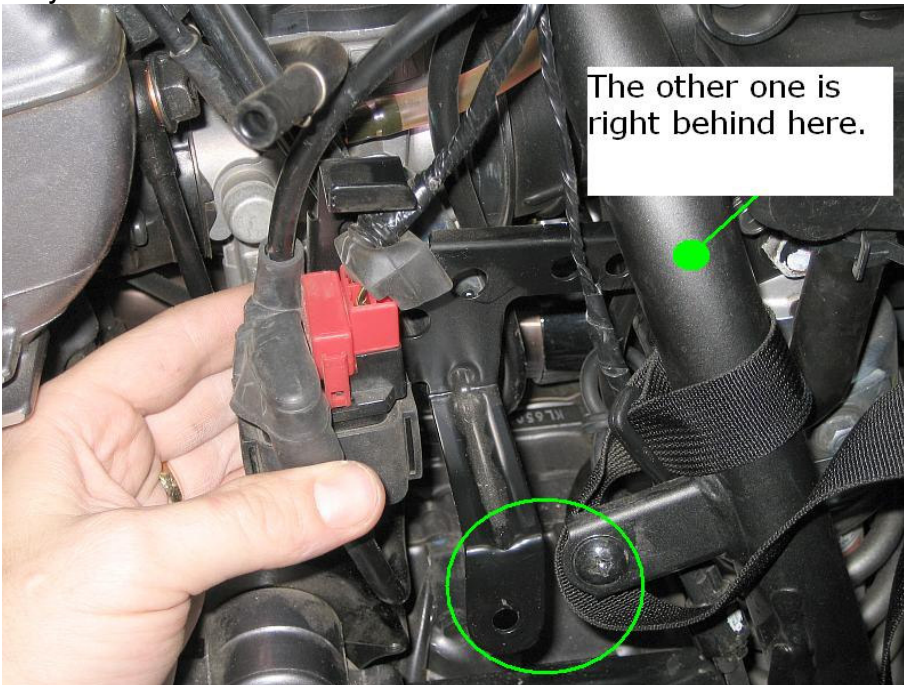




- 6) Next, remove the cover for the starter relay by removing the Phillips screw.



- 7) Then, remove the screws that hold the starter relay bracket to the bike. Notice that when I remove screws & bolts, I immediately replace them into the holes they came from.



- 8) Next, pull the skid plate. There are four screws holding it on, symmetrically placed on each side, as indicated below.



- 9) Time to drain the coolant. First, remove the coolant drain plug from the bottom of the coolant pump enclosure on the right-hand side of the engine, shown below. The coolant will start to trickle out. I used my oil pan, but first, I cleaned it by putting some rubbing alcohol on a paper towel and cleaning it out.



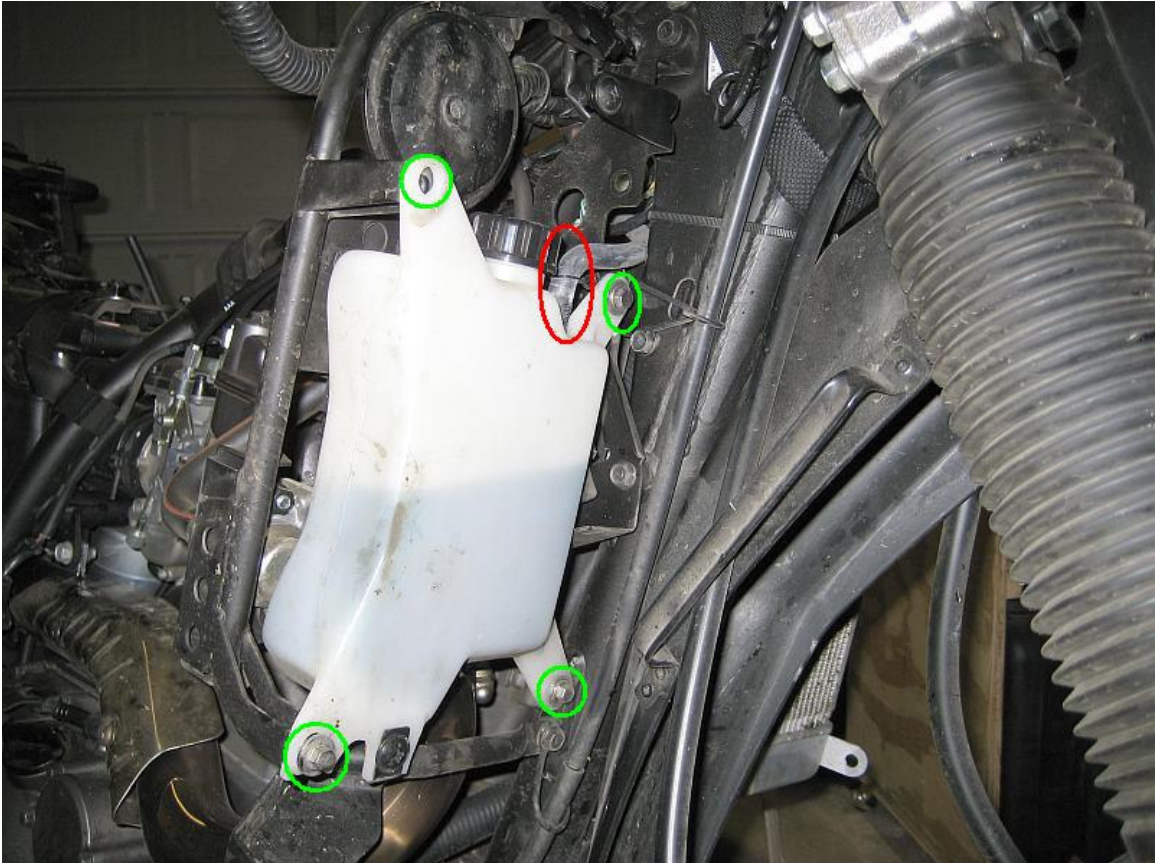
- 10) Once the coolant starts flowing out, go around to the left side of the bike, hold it vertical, and remove the radiator cap from the radiator. The coolant will come out like mad after that. When it is done draining, put the bike back down, come around to the right side of the bike, and lean it towards yourself to get the last few ounces out.



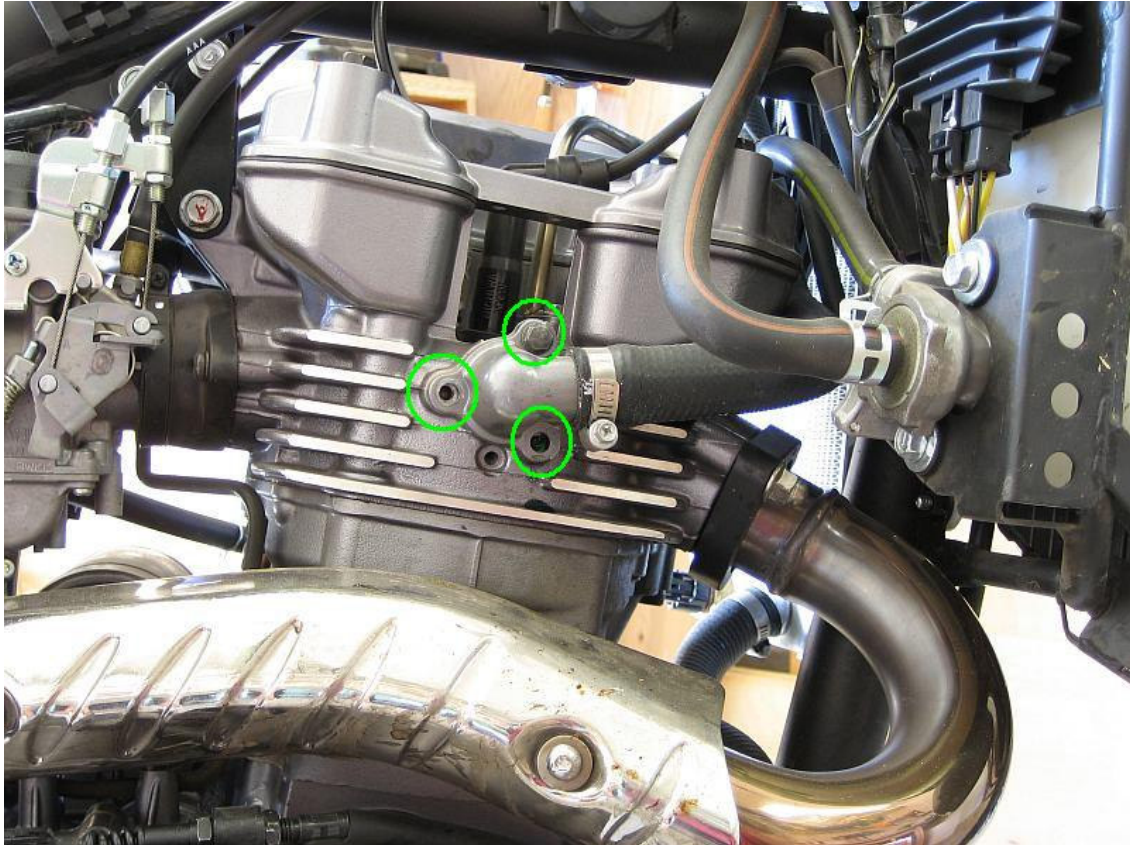
- 11) Next, drain the coolant from the coolant reservoir tank. You'll need to take off the guard for it first:



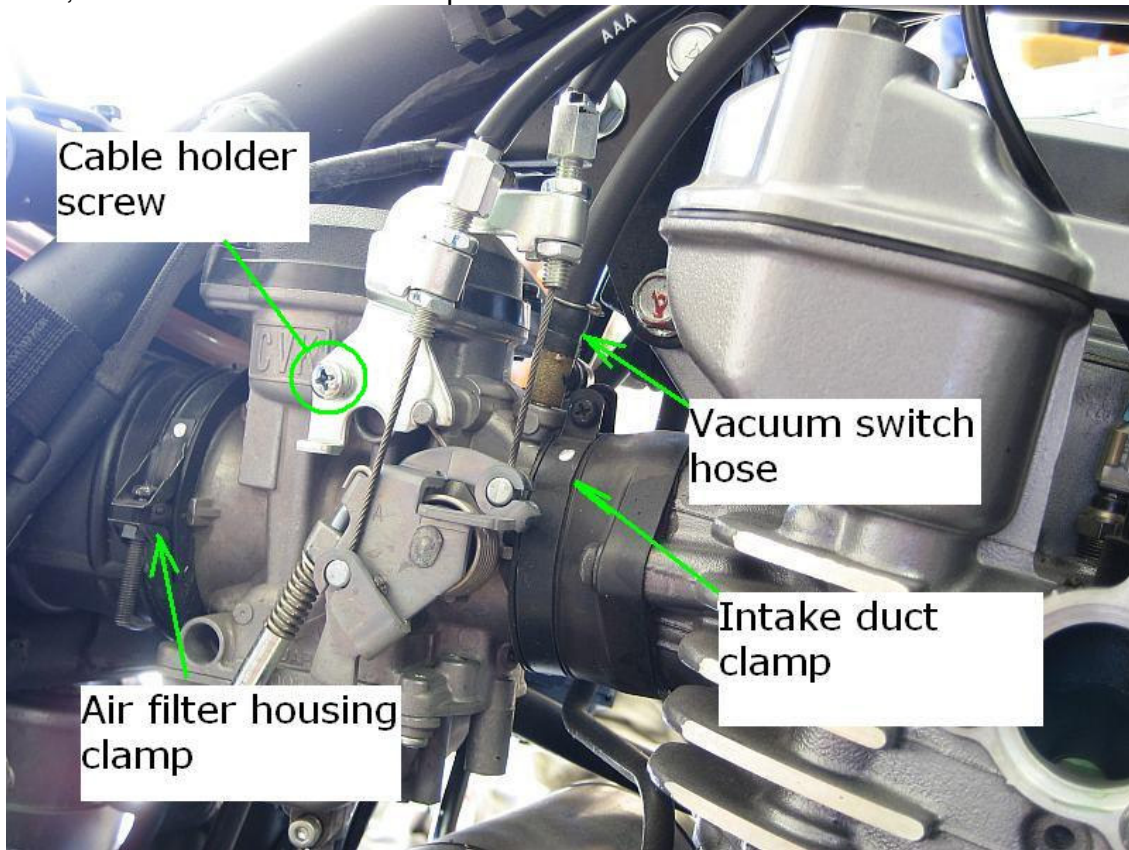
- 12) Now, it's time to empty the coolant reservoir tank. Take off the overflow hose, by loosening the spring clip. The four bolts holding it on are in green, and the overflow hose and spring clip are circled in red. On mine, the top left one had vibrated itself out and was lost, so when you put this back on later, I suggest using blue thread locker. Once these are all removed, take off the cap, maneuver the tank around so you can dump it into the drain pan that contains the rest of the coolant.



- 13) Next, remove the thermostat housing, and pull the thermostat out of the engine. If there is an accumulation of rubber particles on the thermostat, there's probably a hose somewhere in the cooling system that is coming apart. Replace the bolts in their holes.



- 14) Time to pull the carburetor. Disconnect the vacuum switch hose from the carb. Remove the clamps from the air filter housing duct and intake duct by removing the Phillips screws, rotating them around and working them off. Also, remove the cable holder screw. Rotate the cables down so they can be pulled out the slot. The cable holder assembly is now hanging loose. I used a cable tie to tie it up to another cable tie on the main frame and keep it out of the way. If the cable holder screw is too tight, **don't pound on it or use an impact driver**, or you risk cracking the carb, which is BIG bucks, for such a cheap pot metal thing. In that case, remove the cables instead, and mark their positions. Since my '09 is nearly new, this screw hadn't frozen up.

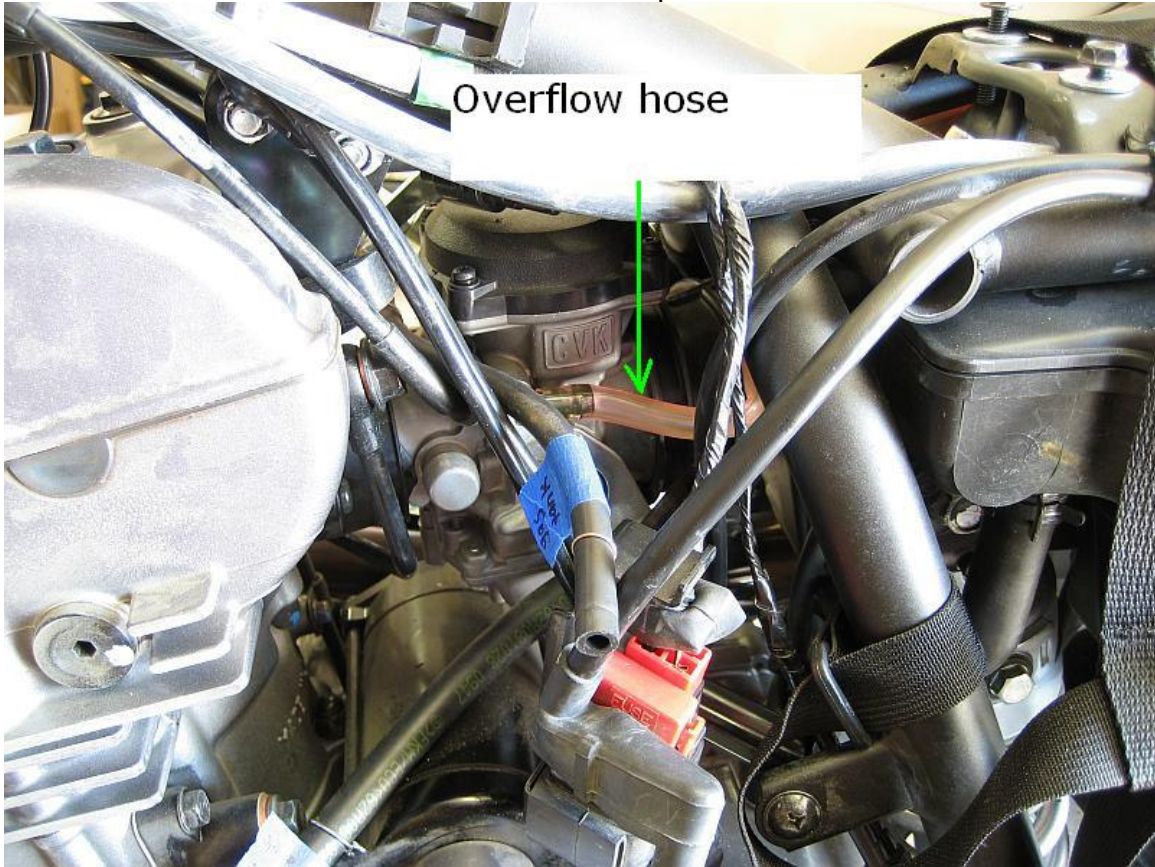




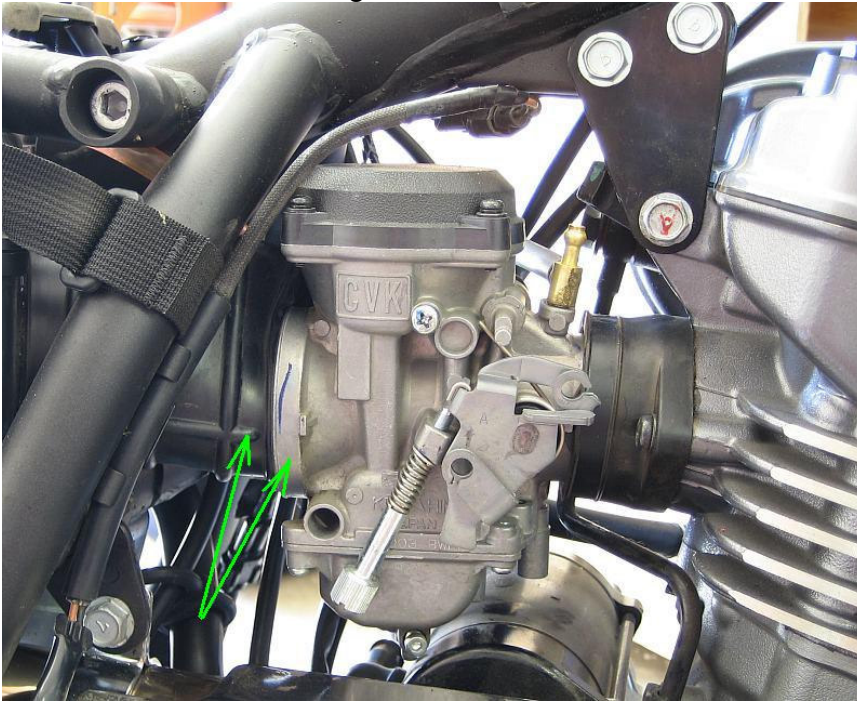
- 15) This is about the point where I started bagging and labeling parts. Up to this point, I could simply put the bolts back in the holes that came out of, and it would be obvious later. After this photo was taken, I started overlapping the edges of the bags, so it was obvious in which order the parts had come off.



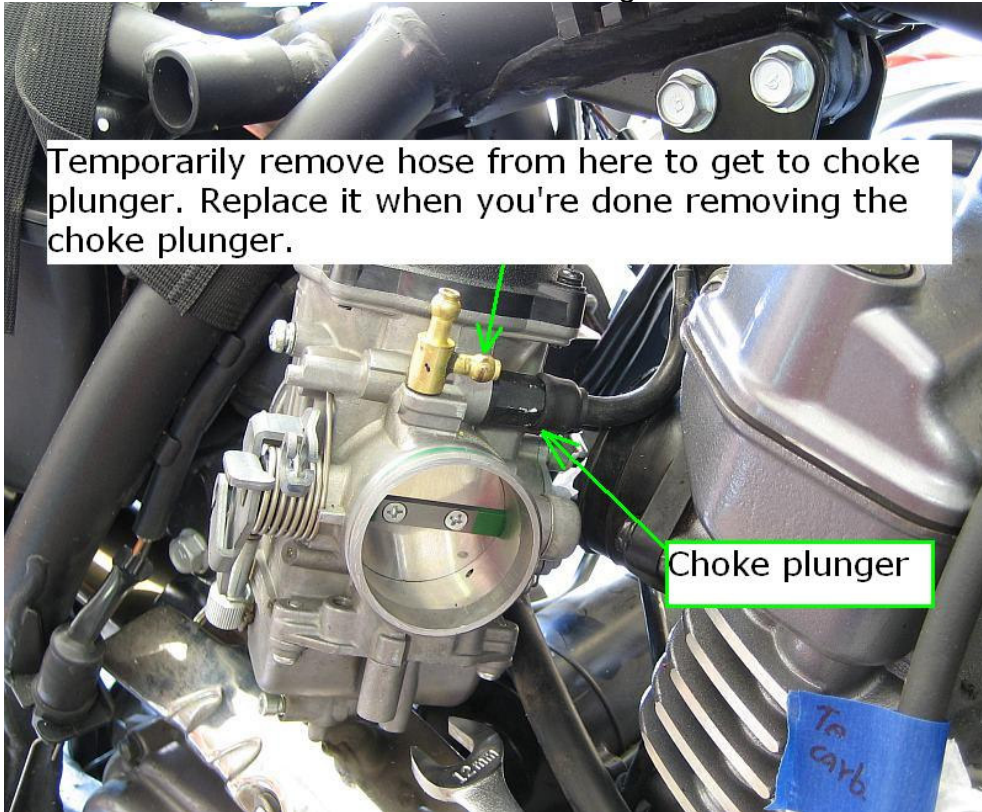
- 16) Next, remove the overflow hose from the other side (left) of the carb. This one doesn't have a clamp; fine with me! All the same, it is on pretty tight. I had to pry the end of it with a flat-head screwdriver to help work it off.



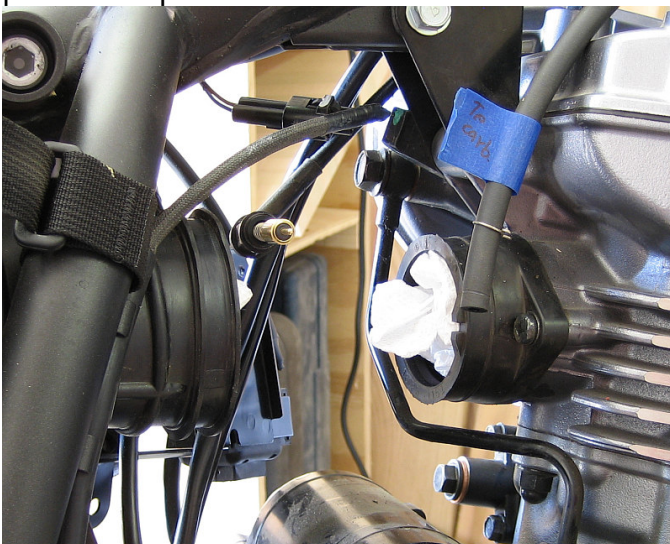
- 17) Work the air filter housing duct off the rear of the carb, as such:



- 18) Then, push the carb back and pry the intake duct off the front of the carb. Rotate the carb so you can get to the choke plunger. You may have to temporarily remove a hose so you can get a 12 mm open-end wrench on the choke plunger. With this done, remove the carb. from the right side of the bike.



- 19) As you progress, fill the holes with paper towels to keep junk from getting in there. I started labeling all the hoses too. Masking tape will work, I only had painter's tape on hand.



- 20) Get a 3 mm socket head (“Allen”) wrench, and take the carb over to the gas tank. Open the gas tank, and loosen the float chamber drain screw to drain the remaining gas out of the carb and back into your gas tank.



- 21) Now, to remove the exhaust pipe. Remove the rear brake reservoir cover. It is held on with two #3 Phillips screws here:



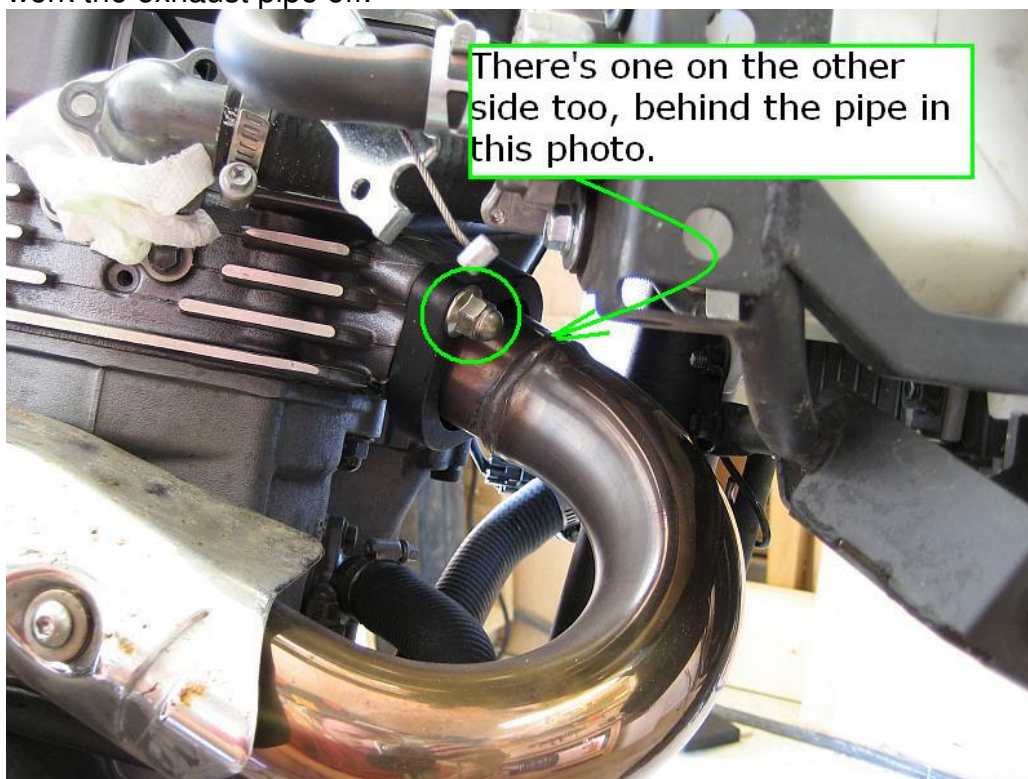
- 22) Get your 6 mm allen wrench and loosen (no need to remove) the exhaust pipe clamp bolt. It is the lower circle in this pic. Since I don't have any ball allen wrenches, I had to also remove the bolt holding on the rear brake reservoir. (no biggie, upper circle) Loosely replace the screws back through the bracket that held the cover on, indicated by the arrows. I bagged & labeled the cover. There's starting to be a lot of covers & panels laying around...



- 23) Remove the exhaust pipe bracket bolt:



- 24) Next, remove the exhaust pipe retaining acorn nuts, on the front of the engine. If they're corroded or stubborn, first apply a penetrating oil, let it soak in, and work the nuts back & forth a bit to break the corrosion loose. After this step, you can work the exhaust pipe off.



- 25) Look at all that soot, and in only 3330 miles! I'm glad I'm doing this, and I'm hopeful that the 685cc kit will fix this.

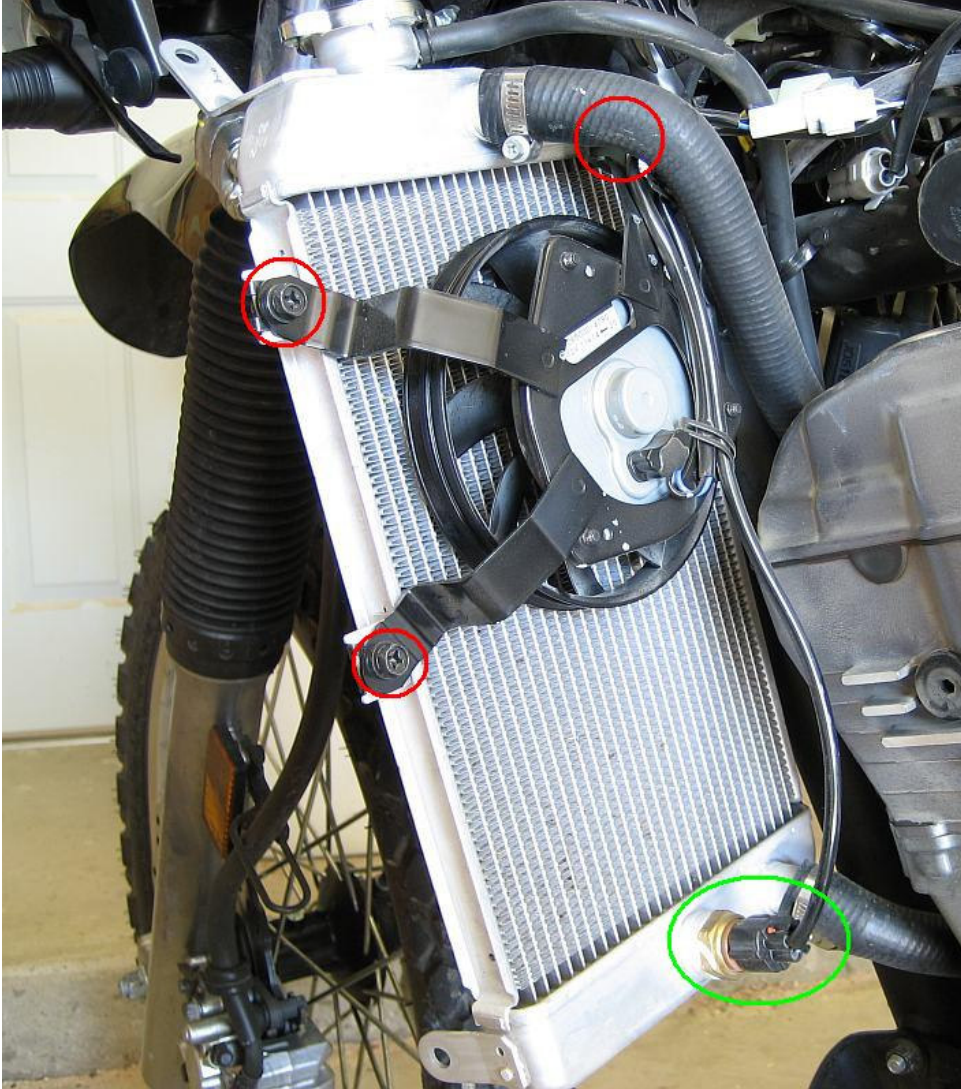


- 26) Before proceeding, I scraped off some of the caked-on soot here, stuffed paper towels in the exhaust opening, and replaced the acorn nuts back on the studs. By the way, Clymer recommends a new exhaust gasket when re-assembling. I didn't notice this until I was putting my bike back together, and didn't have it. So I re-used the old one. If it isn't running right one day, I'll have to remember this... Since you're just taking the bike apart, you have time to order one now.

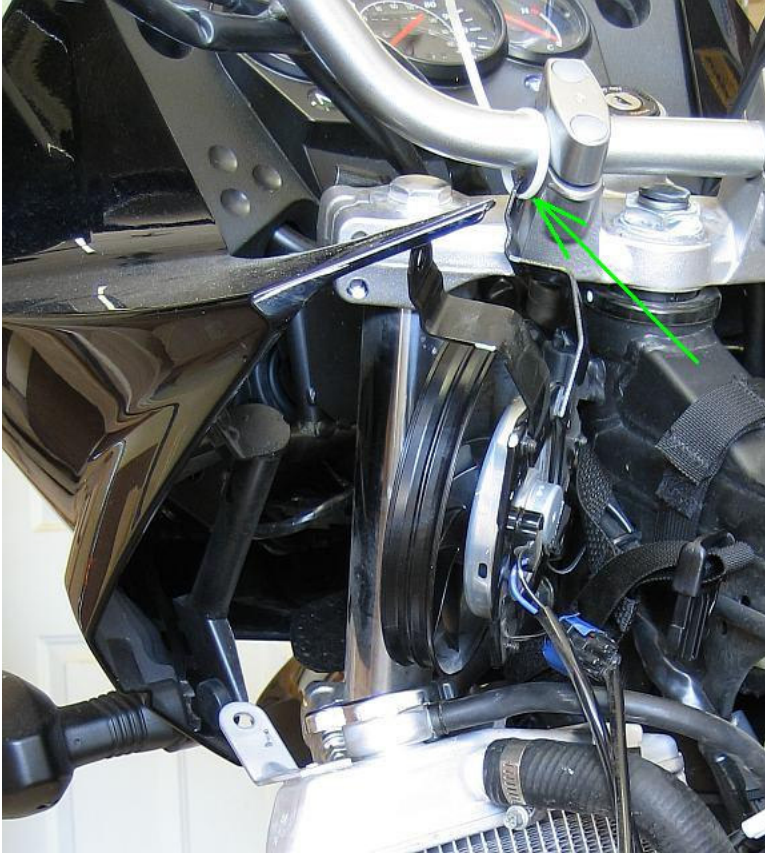




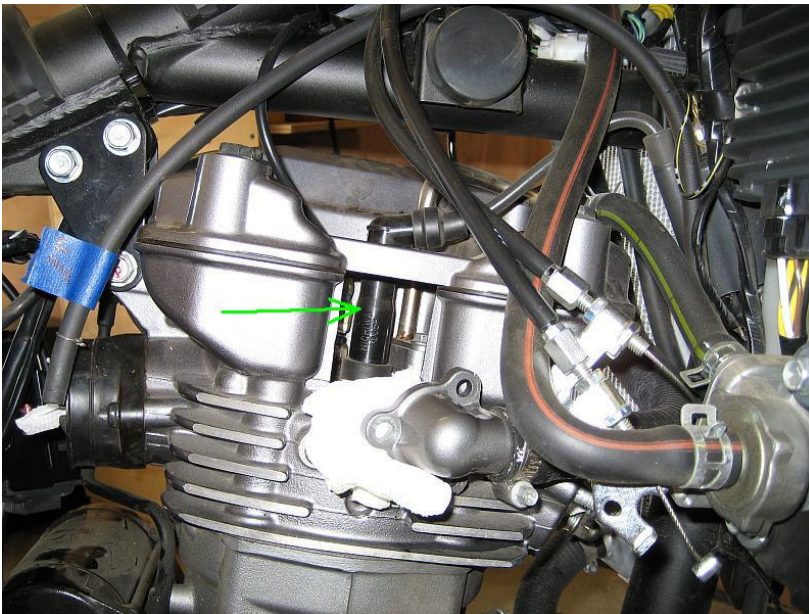
- 27) Now, remove the fan. Unplug the fan connector. (green circle) It is tight, because it is sealed with an O-ring. Then, remove the fan mounting bolts. (red circles)



- 28) I tied the fan up and out of the way with a cable tie to the handlebar.



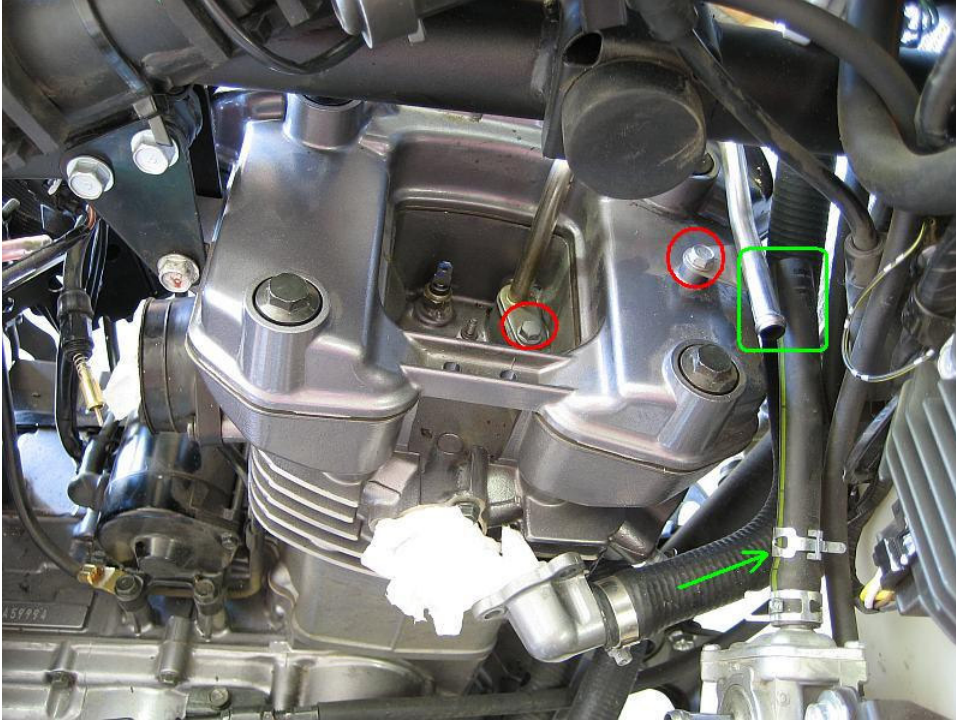
- 29) Pull the spark plug cap, straight up and off. If you want, this is a good time to check the gap spacing and cleanliness of the gap. Mine was kind of sooty, but not too bad.



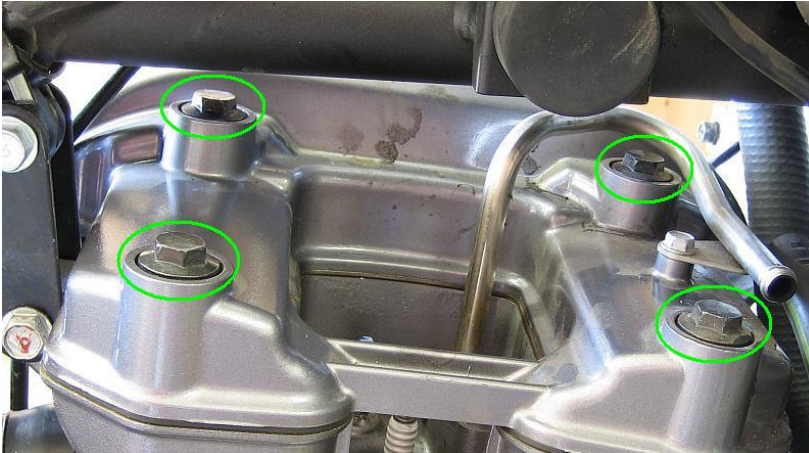
- 30) Next, disconnect the coolant temperature sending unit connector. It's just a quick-connect. Pull it straight up to get it off.



- 31) Disconnect the intake hose from the Clean Air System vacuum switch, (green) then remove the bolts that hold the vacuum pipe and remove the pipe. (red)



- 32) Remove the four valve cover bolts:



← Make a note on the baggie that the shorter ones go on the left.

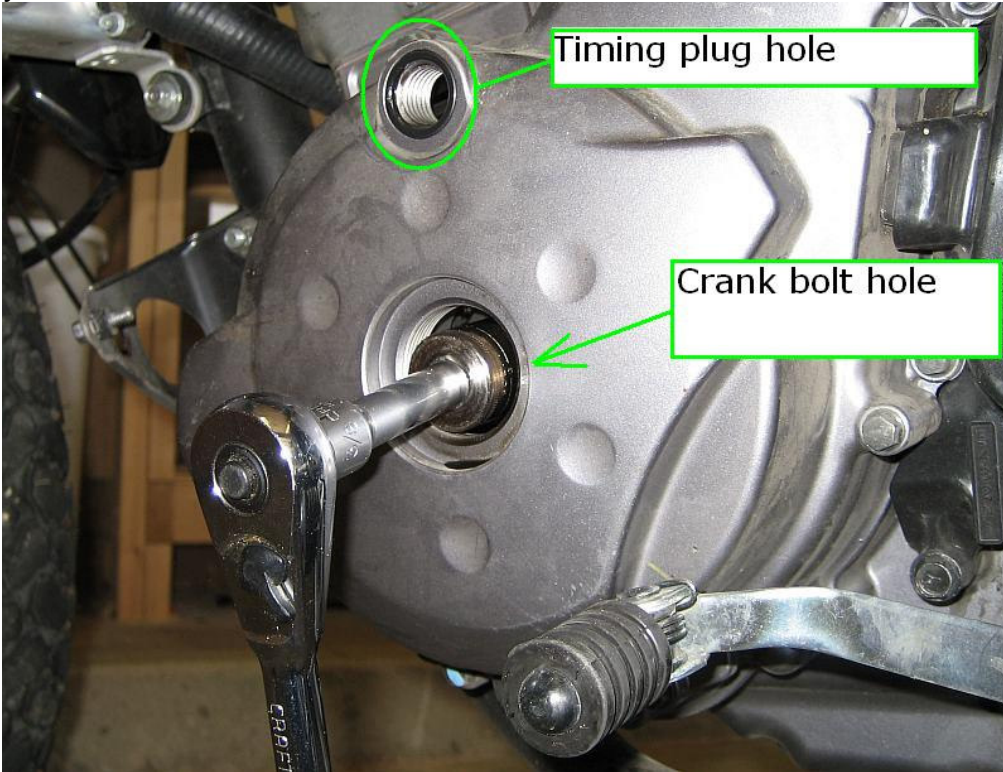
- 33) Remove the left fuel tank rubber mounting pad. Here's where it came from; just pull it straight out.



- 34) Lift up the valve cover, and pull the gasket from the bottom of it. You'll need that space to maneuver the valve cover out from under the frame. It is a tight fit. Looking at the cam lobes, we can tell that the crankshaft is not at top dead center (TDC) to check the valve clearances. We'd be silly not to, since we're in here anyway.



- 35) Now, we need to get the cams crankshaft to TDC. Remove the timing plug (top) and rotor bolt plug. I put a quarter in the slots, and turned it loose with a regular old slip-joint pliers. Watch out so you don't lose either of those O-rings. Then, get your ratchet and, short extension, and 19 mm socket on the crank bolt.



Make sure the bike is in neutral. Look through the timing hole as you slowly turn the crank CCW. When the T-mark lines up with the cut-out in the bottom of the timing hole, check the cam lobes. If the lobes are pointing out from the center of the cylinder, you're at TDC. If not, turn the engine over again, CCW, until the T mark lines up with the cut-out at the bottom of the timing hole. All four cam lobes should be pointing outward from the cylinder center, like so:



- 36) Now that we have the cams in the right position, we check the valve clearances with our feeler gauge set. Starting with 0.004", slide the feeler gauges between the cam and the shim so slight pressure is needed to get it between. Either it will fit or not. If it fits, try to get the next bigger one in. If the next bigger one won't fit, the thickness of that feeler gauge is your clearance. If the next bigger one will fit, keep going until one won't fit. The one before that is your clearance.

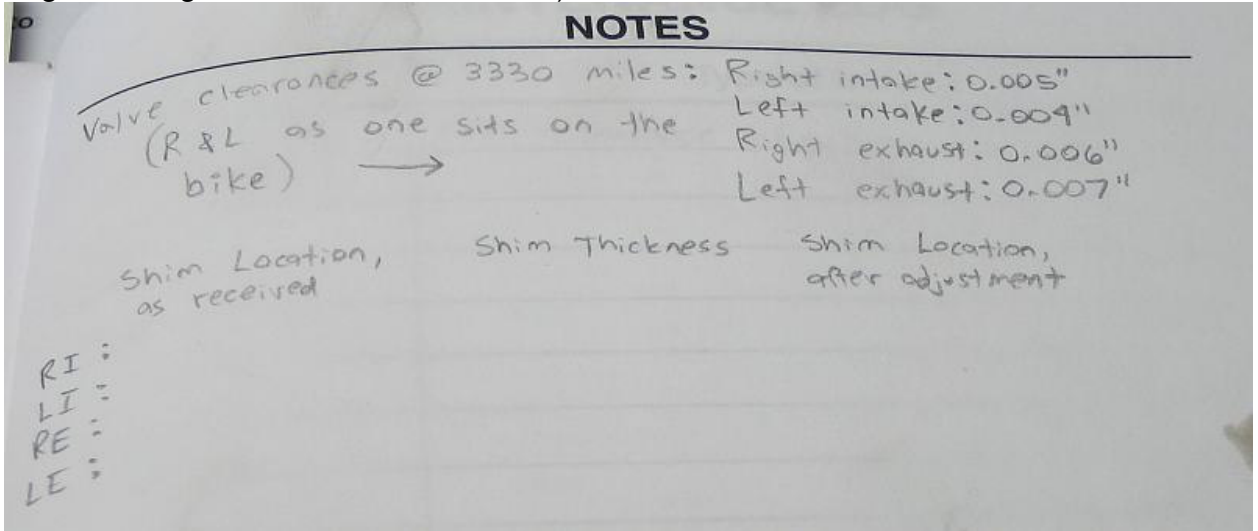


The specs are as follows:

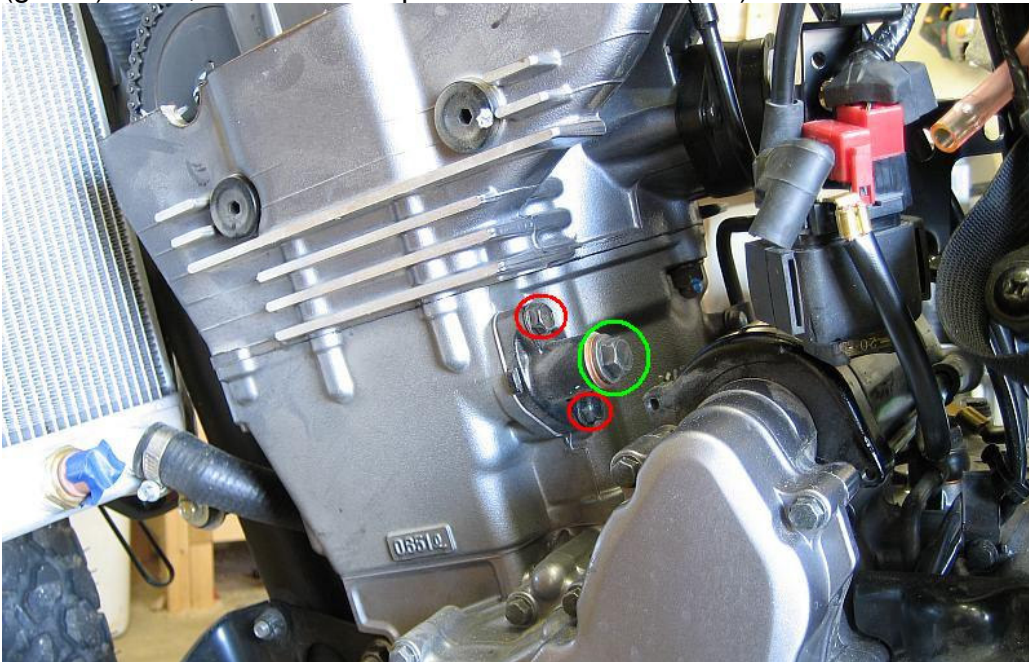
Intake: 0.004 – 0.008" (0.10 – 0.20 mm)

Exhaust: 0.006 – 0.010" (0.15 – 0.25 mm)

- 37) Ideally, we want them to be more toward the top of the spec. Mine were bordering on too tight. I'm going to order or trade for thinner shims tomorrow, and I should have them by the time we are ready to re-assemble the engine. Write down the measurements. I recorded mine in the back of my Clymer manual. Later, when the camshafts are out, we can easily pull the shims to finish up this data. (i.e. – Which shim thicknesses were on which lifters, so we know which way to go with regards to shim thicknesses.)



- 38) Now, let's pull the cam chain tensioner. It is on the left side of the engine, about halfway down the cylinder. Loosen the center bolt a bit, but don't remove it. (green) Then, remove the top and bottom bolts. (red)

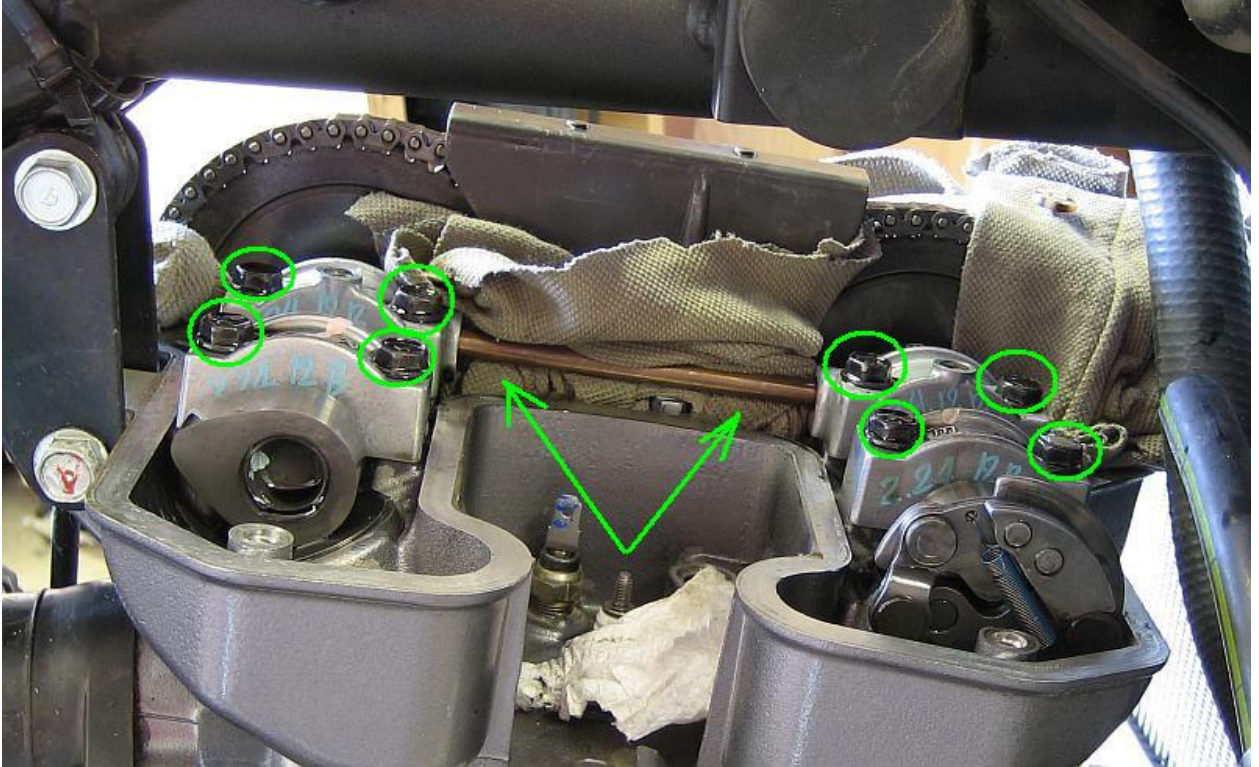


There's no going back now. Once those mounting bolts are loosened, the cam chain tensioner must be removed & reset. The manual has more details on this.



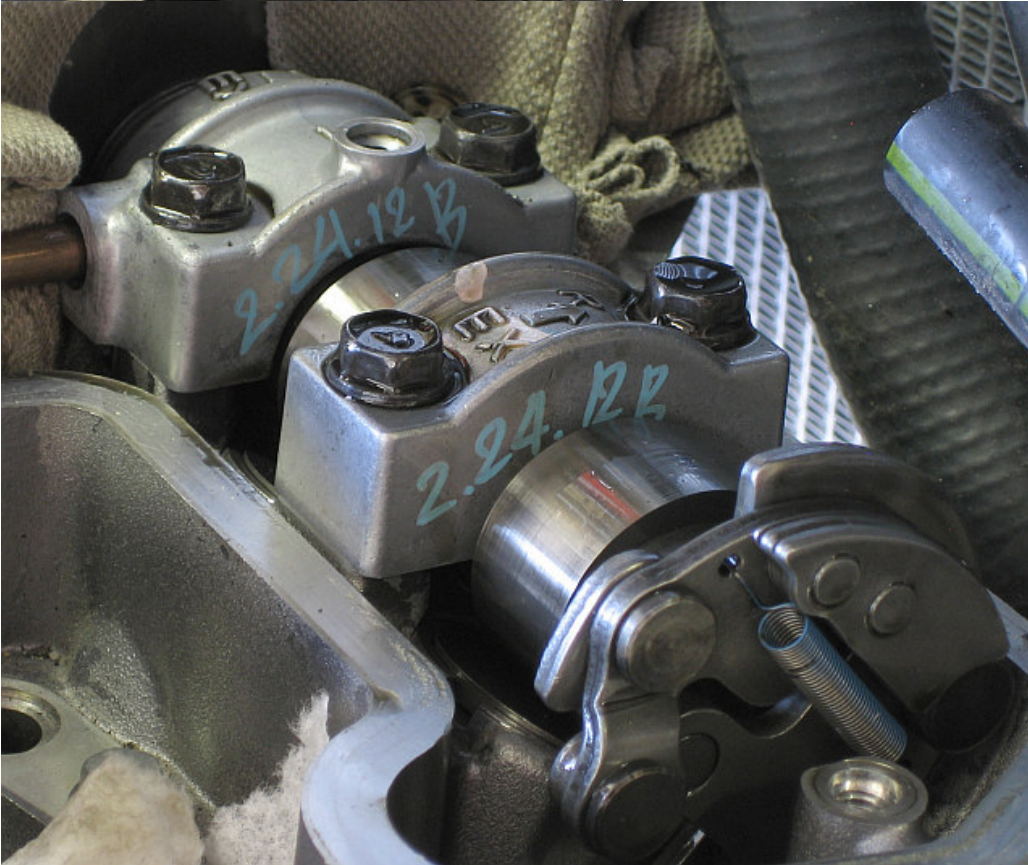
The manual also recommends getting a new copper gasket for this too. Order one now, along with the exhaust gasket.

- 39) Now, it is time to pull the camshafts. The first part to this is to stuff clean shop rags around the cam chain to prevent us from accidentally dropping stuff down in the crankcase.



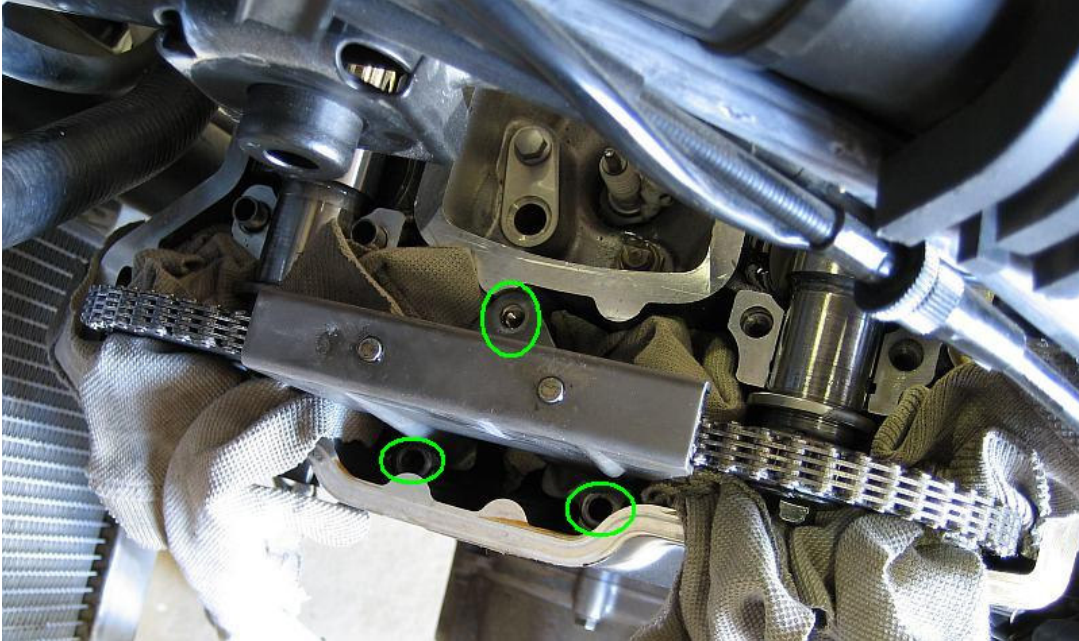
- 40) Then, loosen the eight camshaft cap bolts, circled above. Do this equally and in several steps. There are hollow steel dowels underneath that will only allow the caps to be pulled off from exactly straight up. Do the right intake & exhaust cam caps first. The left ones are joined by an oil supply pipe, so it is easier to remove them both at the same time.

- 41) I took a couple of close-ups of the cam caps, so that if I mix them up, I can still get it back together later:

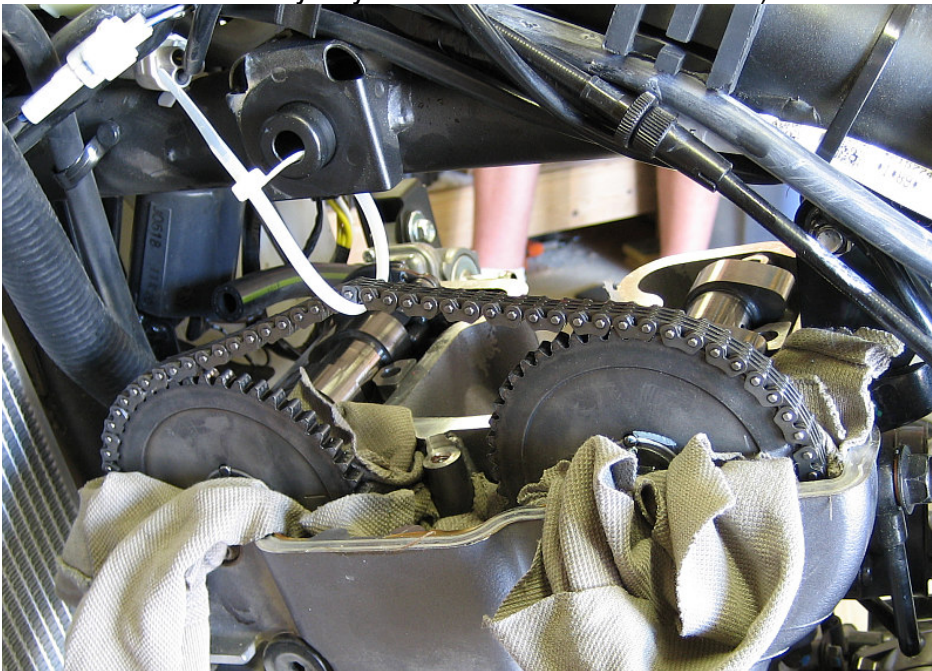


The exhaust cam has a mechanism on the end of it.

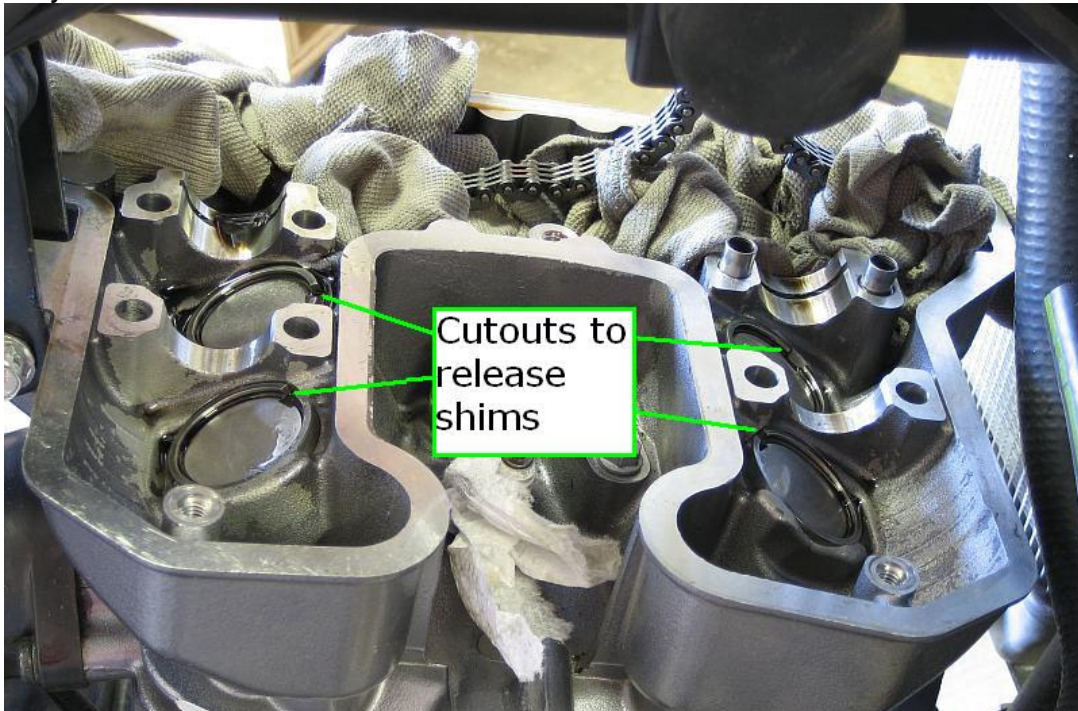
- 42) To remove the upper cam chain guide, double check that the cam chain tunnels are all stuffed with clean shop towels. Dropping a bolt down in there will induce cursing. Remove the three bolts holding on the guide. (8 mm) You'll need an extension. (I pulled one of the rags out after I got them out for photo clarity)



- 43) By now, the perceptive reader will have noticed that I'm a big fan of using cable ties to hold stuff out of my way. The cam chain is no exception, and this also serves to keep it from falling into the crankcase. (edit: string is better, since it must be removed anyway when the head is taken off.)



- 44) Finally, remove the camshafts from under the cam chain. Your engine top end should now look like the photo below. Double-check that the cam chain opening remains properly covered. This photo was taken after I popped the shims off from the top of the valve lifters. You can see that the edge of each lifters has a cut-out. The purpose of this is to allow us to stick the edge of a small screwdriver blade or pick in there to pop the shims loose. I did this, and wrote down which shim number was on each lifter in the back of my manual. If the cut-out doesn't line up with the upper-most part of the lifter, just rotate it with the tip of your screwdriver; they are loose.



- 45) Remove the engine mounting bolt (bottom) and engine mounting bracket bolts (upper) circled below, then remove the brackets.



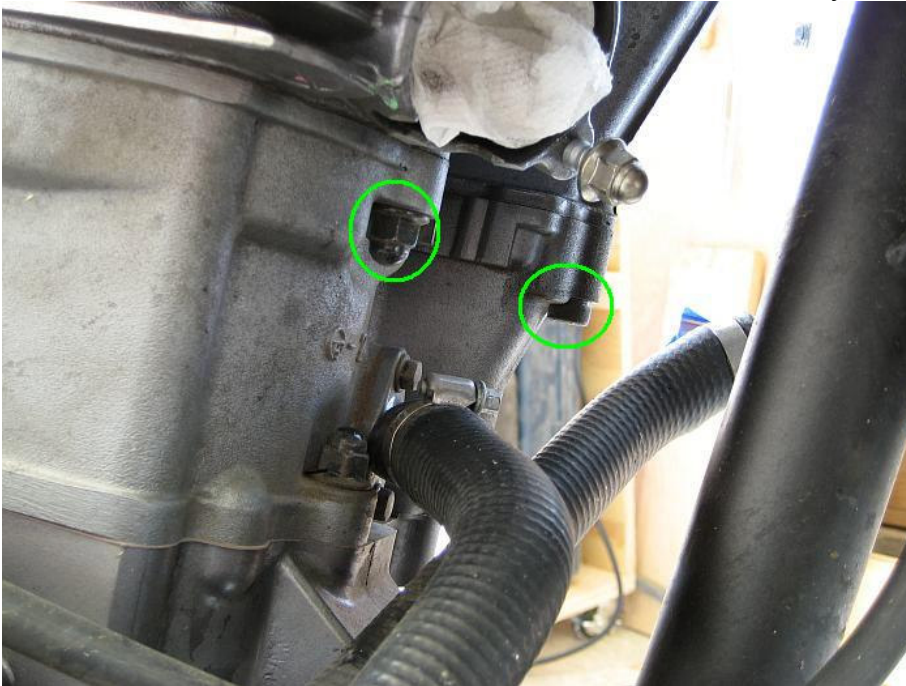
- 46) Remove the banjo bolt (circled) and associated seal washers from the oil pipe. The seal washers are bronze. When you pull the banjo bolt out of the fitting, you'll see why it has a special name; it is a pretty elegant design. (Clymer recommends getting new gaskets for the banjo fitting too)



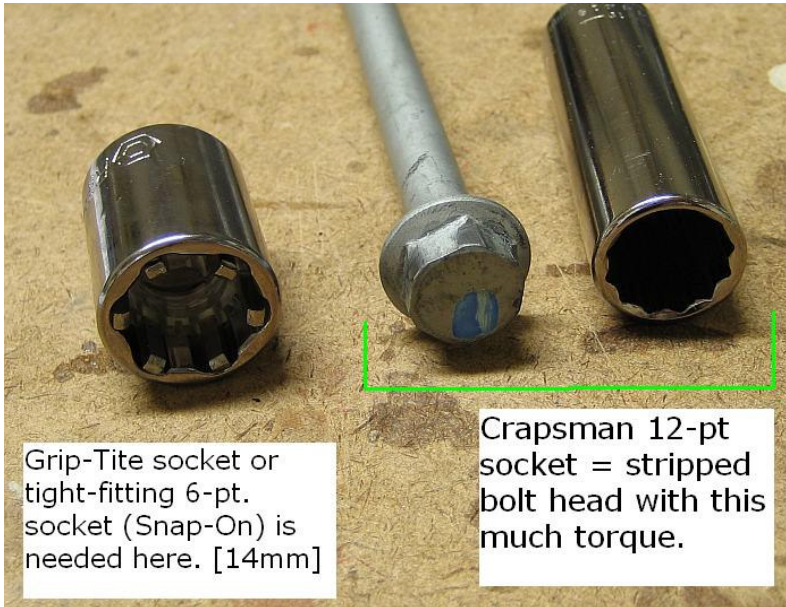
- 47) Remove the acorn nut from the rear of the cylinder head:



- 48) Remove the acorn nut and allen bolt from the front of the cylinder head:

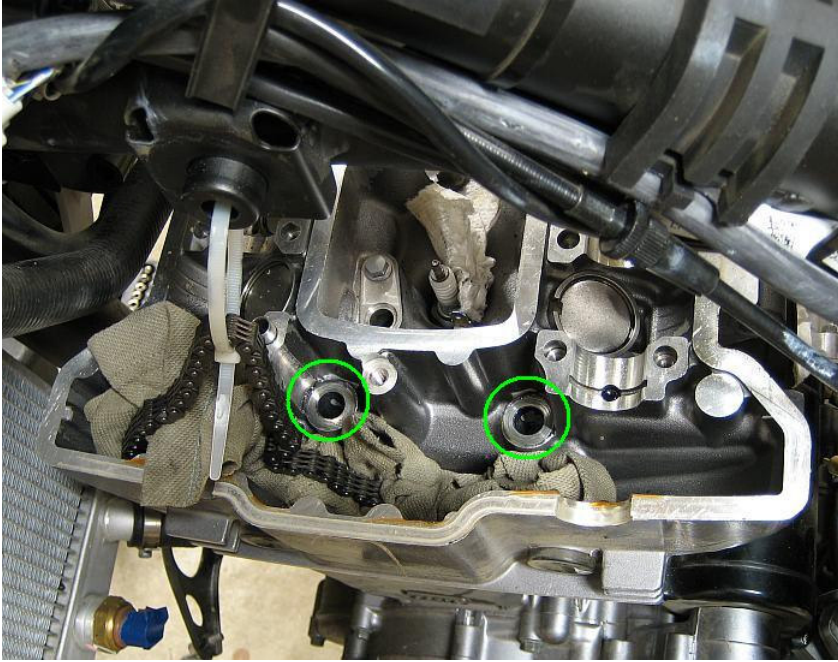


- 49) **WARNING:** Use high-quality, tight-fitting sockets for this next step. Craftsman 12-pt. Sockets will likely strip the heads of the bolts by the time you apply enough torque to break these loose. (voice of experience) After stripping the head of one of them, I went out and bought a set of Popular Mechanics Grip-Tite metric sockets from Sears. (\$25) These sockets grab the bolt head by the flats, rather than the corners, like conventional sockets. Also, on my newish KLR, I needed to put a pipe on the ratchet handle to get enough torque. Careful not to pull the bike off the sidestand when you loosen these. They're ungodly tight.

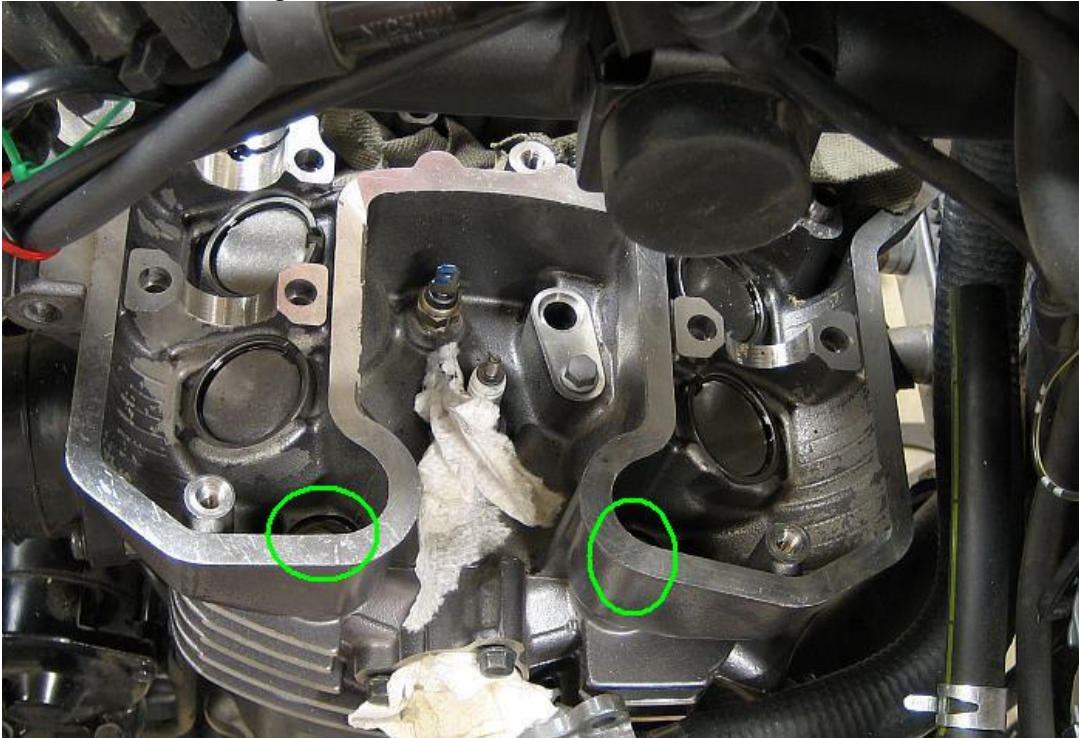




- 50) Stuff the cam chain tunnel with clean shop rags, so you don't drop anything down into the crankcase. Remove the four cylinder head bolts inside the cylinder head. Here's where the left ones were.



- 51) Here's where the right ones are:



- 52) Use a mallet to tap around the base of the cylinder head to loosen it up. A dead blow mallet would work, as would a plastic or rubber headed one.



- 53) When you lift off the cylinder head, watch out that you don't drop the locating dowels. (circled) Note all the carbon from the burnt oil. (arrow) Hard to believe this is a four-stroke and there are only 3300 miles on it. Also, in this shot, the head gasket is still stuck to the head. Gently chip off any carbon with a screwdriver.



- 54) Here's what the top of the piston looked like. Not. Cool.



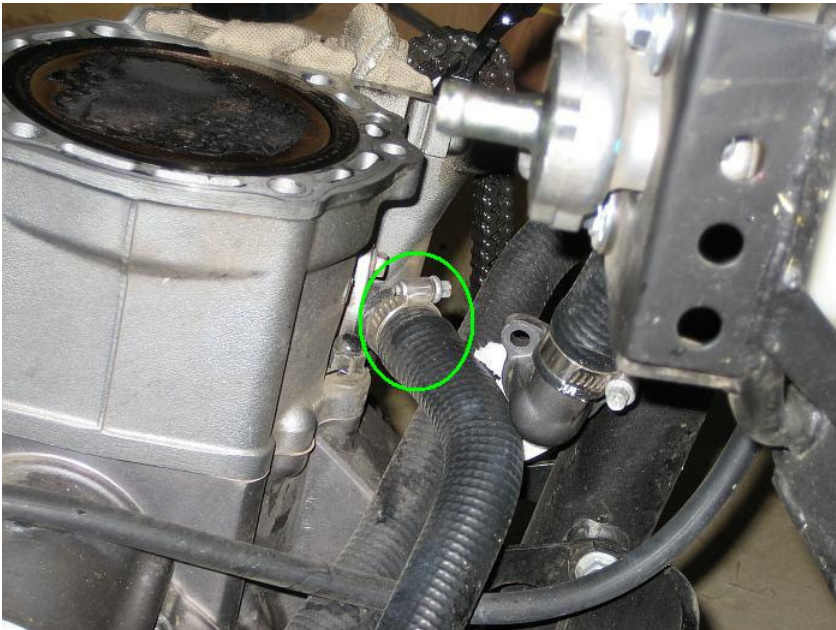
- 55) Remove the head gasket from the bottom of the cylinder head or the top of the cylinder. I was able to get a fingernail under it, then gently pry it up with a putty knife.



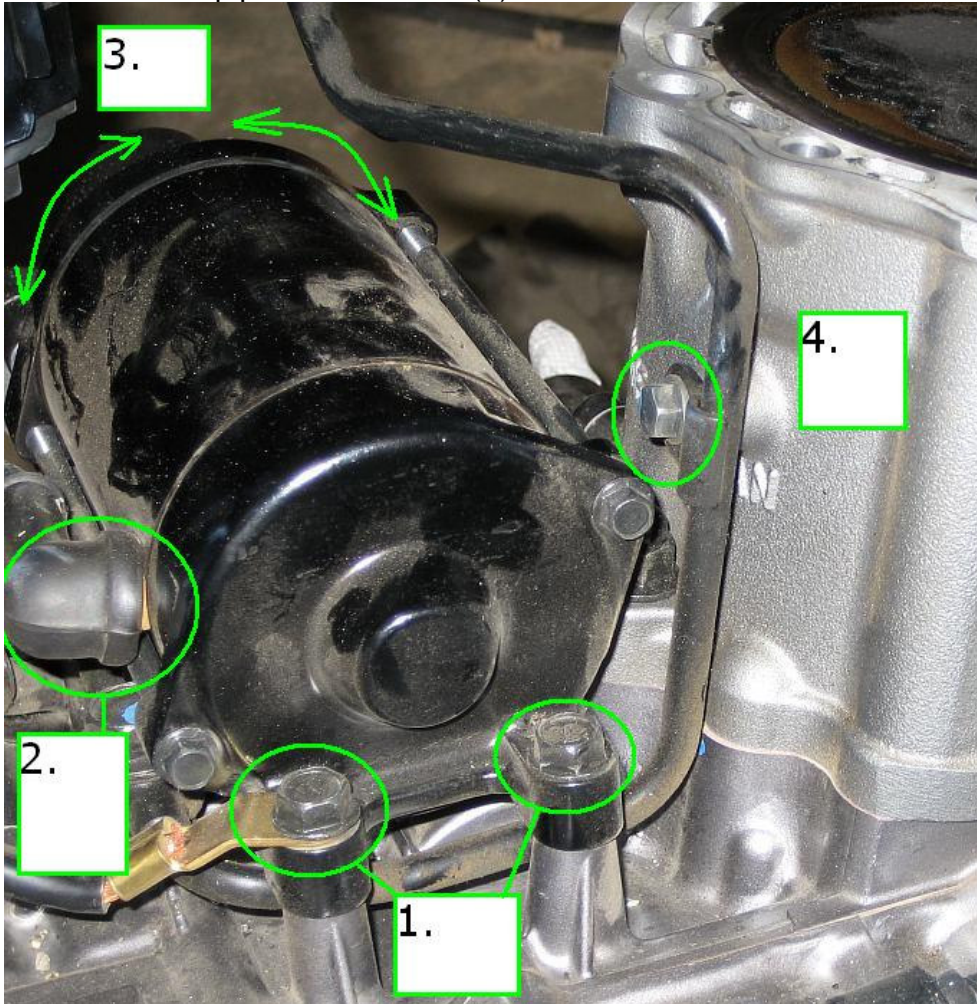
- 56) At this point, I tied the cam chain to the shift lever, so I don't drop it in the crankcase.



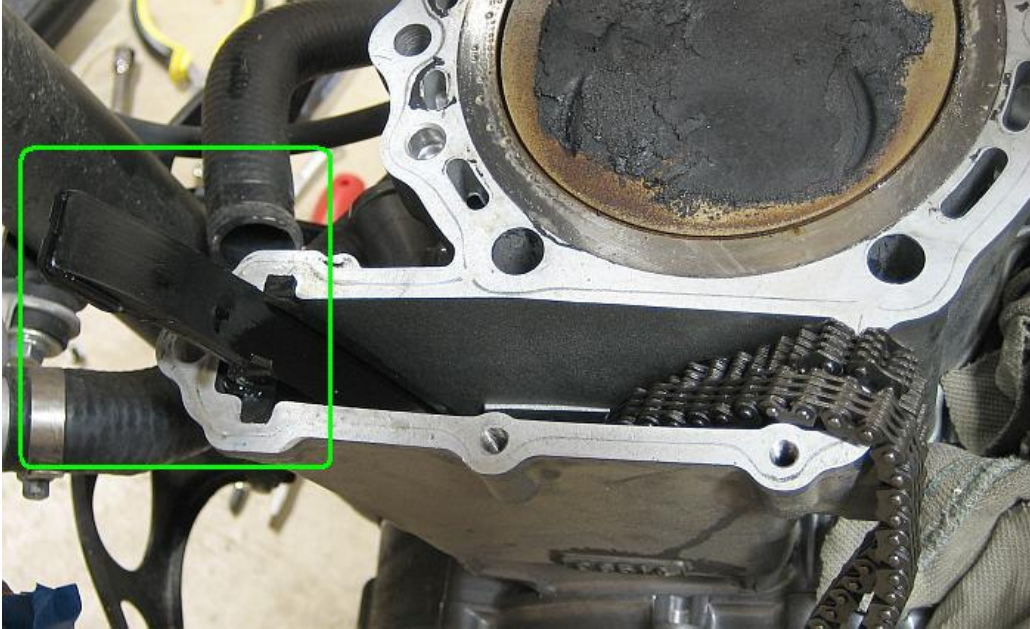
- 57) Now, it's time to pull the cylinder. Remove the coolant hose from the front of the cylinder, by loosening the hose clamp, breaking it loose, and sliding it up the hose.



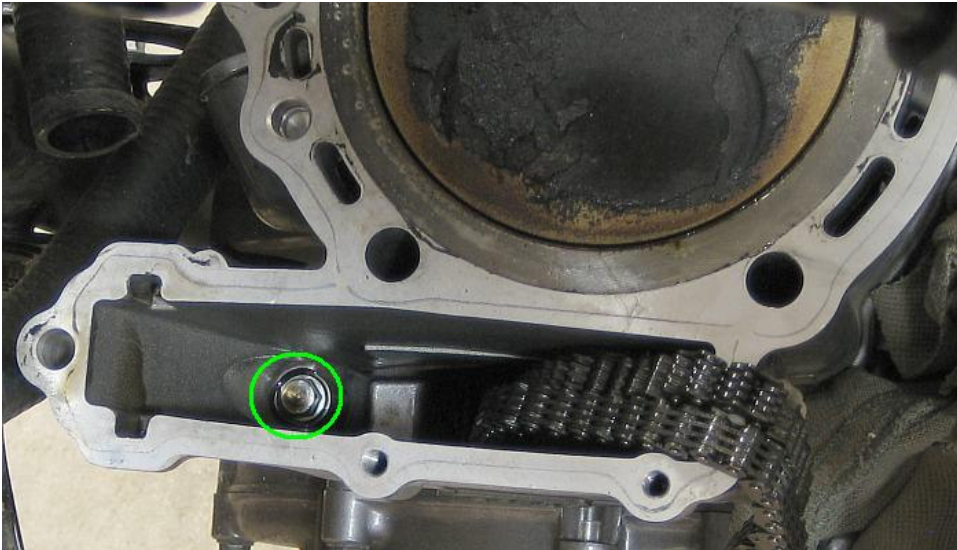
- 58) The Clymer manual doesn't say this, but you'll need to remove the starter motor to get good access to the next couple bolts. Remove bolts (1), which hold the starter motor in place. Then, remove the rubber boot (2) and disconnect the positive lead from the starter motor. Replace the nut. Then, twist the motor back and forth (3) and pull it out. It is held in place by friction with an O-ring. Lastly, remove the oil pipe retainer bolt. (4)



- 59) Now, it's time to remove the cylinder head. The first bolt is under the cam chain guide. Just pull it up, and take care to note how it goes together.



- 60) Here's the bolt:



- 61) Remove the cylinder mounting nut from the rear of the cylinder:



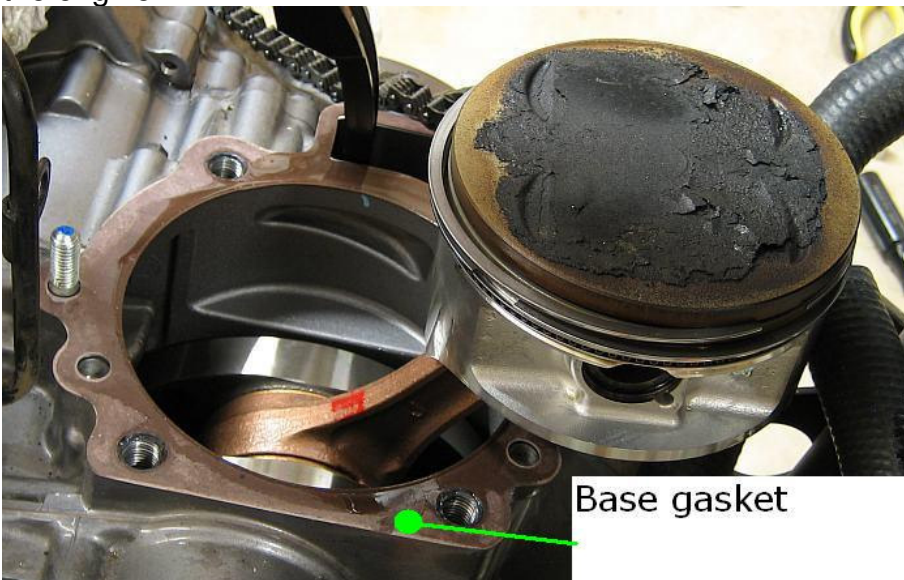
- 62) Remove the front cylinder mounting nut:



- 63) As before, tap around the base of the cylinder with your mallet. Gently lift it up. It'll be a little snug, because of the friction of the piston rings on the cylinder bore. Also, as before, there are two locating dowels. Don't let them drop into the crankcase. I bagged & labeled mine. Remove the coolant fitting and bolts prior to shipping out the cylinder for boring & honing.



- 64) Removing the stock base gasket will go easier with gasket remover chemical. Note that the larger diameter valve cutouts on the piston are towards the rear of the engine.





- 65) Pop the circlips (one on each side) out of the edge of the piston. I gently pried them out using the tip of a small flat head screwdriver where the arrow is pointing. Once both circlips are removed, you should be able to push out the piston pin with your finger and remove the piston assembly from the connecting rod.



- 66) Put a clean shop rag in the gaping hole in the top of the crankcase to keep junk out. What's left of your engine should look like this:



- 67) I overlapped my pieces and laid them out in the order in which I remove them. My workbench wound up looking like this:

