

Repair of 2007 Infiniti G35 VQ35HR Engine with Leaking Oil Gallery Gaskets on Rear Cam Chain Case (Misc Notes)

Problem: At about 71K miles, the G35 set a P0021 code. No other codes, & vehicle ran normally. Code was cleared, and didn't recur for 6 mos, during a long trip. Cleared it again and never recurred. At 74K miles, gauge was attached to check oil pressure, which indicated 9 psi at idle, and 19 psi at 2000 rpm (hot). Min spec per FSM is 14/43. Oil warning light never came on. Based on internet research, it was pretty apparent the oil gallery gaskets on the inner timing chain case were failing/leaking oil, necessitating removal of the front/outer chain case and primary timing chain to access the cam timing oil gallery covers beneath the primary chain.

Tips/Notes Based On Repair Experience:

- Critical to check true oil pressure with gauge before/after the job to ensure repair is appropriate, and successful, because engine runs normally even with almost no oil pressure (oil pressure idiot light must have trip point at 5 psi or less!). If P0011/P0021 codes are set, but OP is normal, then failed oil gallery gaskets in the rear chain case are likely NOT the problem.
- Disconnect the neg. side of the battery first thing. Inevitable result of that will be loss of all dash LCD display programming, seat position programming, pre-set radio stations, AND the ECM communication with the tire pressure sensors in the wheels (will get the TPMS warning light on the dash requiring going through the TPMS re-learn procedure afterward – no way around it).
- Oil & oil filter must be removed to do this job, so might as well drain it when first pull car in – while hot – and just let it drain for a while. The more oil you can remove from the oil pan, the less messy later on when pan has to be removed completely. Impossible to get it all due to the location of the pan drain plug – be warned! Coolant must also be drained, as soon as engine cools down.
- Really helps to photograph the engine from every angle prior to dismantle, as well as along the way, for later reference to ensure wiring harness and connectors & timing chain return to original spot upon re-assemble.
- There are so many small (10 mm) bolts holding brackets, wiring connectors, etc. that I found it easiest to know what goes where by simply replacing the bolt in its original bolt hole once the part it secured is removed. For larger 14 mm bolts (like PS/Alt bolts & lower bracket) I simply used a black marker to literally write on the bolt where it came from (like "PS bolt - thru pulley wheel" etc.). It is interesting to note that virtually every bolt removed is either 10 mm, 12 mm, or 14 mm, so best to have deep & regular sockets for each of those sizes ready at hand (plus a 2" extension).
- The front of the car must be raised up at least 10" or so on jack stands or ramps to allow clearance to remove parts below the car, and to work on the engine from beneath the car.
- Follow the dismantle steps in order as described in the FSM for timing chain removal beginning at p EM-48. However, for this project, there is no need to remove the intake manifold collector, electronic throttle control actuators, water piping to the throttle actuators, valve covers, nor spark plugs, because the intake & exhaust cam sprockets will not be removed nor will the secondary cam chains. Int cam-to-exh cam timing should not be lost at any time, although it will be very easy to lose bank-to-bank timing as well as cam-to-crank timing (which I did, as discussed later).
- The wiring harness(es) seem to be secured to the engine using dozens of snap-on clips. Those clips are, in many cases, nearly impossible to squeeze-release. The quickest way to deal with the stubborn ones is to simply cut the securing band that holds the wiring loom. Once cut, the securing band can simply be pulled out of the snap clip, and upon re-install, a simple zip-tie can be run through the OEM snap clip and secured around the loom to stabilize the harness link.
- After removing the coolant overflow bottle, it's easiest to go ahead & remove the radiator fan assembly & wiring harness. Once the wiring harness to it is removed & laid back over the RH fender and the two bolts

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removed, the fan can be raised slightly to clear the bottom tab slots, then the left side (facing it) dropped down to slip between the radiator support and sway bar, dropping it out the bottom.

- Once the fan assembly is out, now is the easiest time to remove the serpentine belt.
- There is a heavy cast iron bracket on RH side of engine to which the PS pump is bolted. It must be removed before the idler pulley bracket will come free. It is secured to RH engine side by two 14mm bolts that can be easily (and only) reached from beneath the car (easily seen from top side). But before they can be reached, the alternator must be unbolted and dropped completely out of the car (drops out from below). Then the two bracket bolts are reachable, but they are tight & requires heavy wrench to loosen. The alternator has a loom securing tab that must be released before removal, as well as the connecting clip and the ground wire.
- The PS pump is easily unbolted from the cast iron bracket but that really isn't necessary. Once the alt is removed, the bracket/pump can simply be moved outboard as a unit after removal of the two bracket bolts, but must be supported with strings or a strap to keep the weight of the PS pump from stressing the hydraulic hoses attached (same thing with the AC compressor).
- On the LH side, the AC compressor is easily unbolted from beneath the car (particularly the rear bolt) and moved outboard (but supported, don't hang it from the refrigerant hoses!).
- Once all pulleys & other obstructions are removed from the outer (front) timing chain case, it's time to remove the CVTC valve timing covers on LH & RH sides. They must be unbolted carefully & in order (see FSM) to prevent warpage. They each have two locating dowels attached so may be a bit tight, and must be pulled straight out until the intake timing control shaft (with 3 black sealing rings) has completely cleared the intake sprocket, to avoid damaging it. Do not turn them open-side-down after removal as the exh retarder brake pad/disc can fall completely out. Handle very carefully if intent is to reinstall without changing the sealing rings (which technically are not available for the 2007/2008 VQ35HR). Set them both aside & cover to keep dirt out.
- Now is a good time to remove the main crankshaft pulley. But first, turn the engine over clockwise (facing engine) by the 19 mm pulley bolt until the unpainted TDC timing mark aligns with the TDC stub sticking out on the front chain case cover (it will be 10° – 15° right of vertical). Because the valve cover has not been removed, you don't know at this point whether the #1 cyl is on the compression or exhaust/intake stroke. That will be important later on! The crank pulley bolt is installed with probably 175 – 200 ft/lb (a guess) so it will be impossible to remove it without securing the engine from turning. There is no room to get an impact wrench between the pulley & the radiator. Rather than buy the \$230 special flex plate immobilizing tool the FSM recommends, I used a 24" chain wrench wrapped around the pulley to keep it from turning. I cut a 10"-12" section of the removed serp belt to wrap around the pulley to protect it from damage by the chain wrench. Then, with chain wrench secured around pulley on RH side, I used a ½" breaker bar 18" long on the 19mm impact socket with a 36" cheater pipe attached to the breaker bar. It took every bit of that setup to break the bolt loose. The breaker bar bent 15° or so and when the bolt finally let go, it sounded like a rifle shot. I've never removed a tighter bolt without an impact wrench. But this worked without damaging either the bolt or the pulley. Once the bolt is out, the pulley can simply be jiggled/wiggled/tapped by hand and it will simply slip off the crankshaft snout. A wheel-puller is not needed (& likely wouldn't fit anyway without removing the radiator, at least none of mine would). The chain wrench is needed again to reinstall bolt.
- Now time to begin process of removing the front timing chain case. It's a total bitch to remove!!! **But first thing** that must be done before front timing case can be removed is to remove all lower oil pan bolts (in order) & then use an RTV seal cutter tool to tap around the lower oil pan seam to cut the RTV gasket & release the lower oil pan from the upper oil pan. **WARNING:** there WILL be about ½ qt of oil remaining in the bottom of the pan so expect a mess (have drain pan handy) when the oil pan finally lets go. Nearly impossible to avoid spilling plenty of oil here. Inside the upper oil pan toward the front will be two 12 mm

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bolts that clearly bolt into the front timing chain case cover. These must be removed now, or it will be impossible to remove the front timing chain case cover without destroying it.

- Now to the front timing chain case. Remove all 26 of the 10 mm and 14 mm bolts in multiple passes & in order per the FSM to avoid warping/bending the huge chain case cover. Most of them will have RTV covering the threads from the previous install, and so must be cleaned completely on wire wheel before re-install. Once the bolts are out, likely the case will still be stuck VERY tightly due to the RTV seal. The small divots in the case illustrated in the manual and which are to be used to prize the cover off, are totally useless!!! They are way too small to provide any leverage, and they are filled with cured RTV from previous install. Don't even bother with them. And don't try to loosen the cover by striking it. That will only destroy the cover. The only way I could even begin to open a small crack into which to install the RTV seam cutter tool was to insert a pry bar between two adjacent bolt bosses on top RH side (one on the front cover, and one on the rear cover) which are close enough to use the bar, then VERY GENTLY prize the covers apart just enough to hammer the seal cutter tool into the seam (helps to have 3 hands). Once the seal cutter is inserted, nothing to be done but to slowly/carefully tap the seal cutter all the way around the front case following the seam carefully. It's tight, it's slow, it's a bitch, but if you try to take a short cut & just pull it off once the top is free, it'll bend/warp the cover & it's trash. Also, note there are two dowel pins in the rear cover that the front cover fits into. They are located on either side, down low roughly between the level of the #6 & #7 14mm cover bolts. The gasket cutter must be removed and re-inserted beyond these dowel pins to continue cutting the gasket beyond them. Once most of the RTV gasket has been cut, must be very careful pulling the cover free as it will tend to bind on these dowel pins if not pulled straight (or nearly straight) outward. This is easily the worst part of the job, and took me 3-4 hrs to free the front chain case cover without warping it or damaging the sealing surface (if you do either & re-install it, it will leak).
- Once the front chain case cover is removed, the timing chain is exposed. **WARNING, WARNING** – before releasing the chain tensioner, it's a good idea to witness-mark the primary chain-to-sprocket locations on all 4 cam sprockets, as well as the chain-to-crank with a marker or a dab of paint. Ideally, the engine should be turned over until the proper yellow & orange chain links on the primary and secondary chains align with the proper dimpled marks on the intake & exhaust sprockets as well as the crankshaft as described in FSM. The problem with that is it might take 40+ full rotations of the crankshaft to get all the marks to line up per the description in the FSM! And be advised the cams are likely under extremely high valve spring tension, and the instant the tension of the primary cam chain tensioner is released, they will move either clockwise or counter clockwise to relax that valve tension and timing will then be lost. They will spin under the primary chain unless the chain is tightly tensioned. It's very easy to lose chain timing at this point, and don't forget this is an "interference" engine, meaning if the cams are not set to spec position per each other & the crank within a tooth or two, the valves will hit the pistons on the first crank completely destroying the engine. I originally lost timing due to a stupid move & hopping cams, and had to turn the engine over 41 times to get the marks to the proper position on the intake & exhaust cams (since the secondary chains had not been removed), then simply set the crank to the proper TDC location, and removed/reinstalled the chain with all witness marks & colored links in alignment as described in the FSM. Once I did that, I realized I originally had the LH cams correctly set per the crankshaft, but the RH cams were two teeth off. Had I re-assembled & started it in that configuration, it wouldn't have destroyed the valves (I think), but it would not have run (or run extremely badly) and I'd have had to tear it down & do it all over again.
- Once the chain is properly marked and/or positioned with the crank & cam sprockets, simply release the tensioner per the FSM procedure, release tension on the chain, and remove the tensioner, tensioner chain shoe, and upper guide shoe, and then remove/set aside the chain.
- That will then fully expose the lower "L" and upper "T" variable valve timing oil gallery covers that must be removed with a Phillips-head screwdriver or driver tool. They are not tight, & removal is pretty straightforward except for the upper left screw that is beneath the RH intake cam sprocket. It is difficult to reach. To reach it, I cut off about ½"-5/8" of the Phillips head portion of an angle screwdriver & filed two

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opposing sides down to get flats, then used a 4" adjustable crescent wrench to carefully remove (& re-install) that last screw. If, when the covers are removed, it appears part of the OEM paper gasket is gone or squished out of the covers, then that's the cause of the low oil pressure and/or the P0011/P0021 codes! Replacing the crappy OEM gaskets with the newer steel-core gallery gaskets should solve the problem and prevent recurrence.

- There is no torque spec for the Phillips screws into the gallery covers. I just snugged them up good, and used Locktite Red (high-strength) on them to ensure they wouldn't come loose. They had no thread-locker on them originally.
- From this point on, it's just a matter of re-assembly in reverse order of dis-assembly & following the procedures described in the FSM (particularly with regard to compressing/installing the original chain tensioner).
- Take great care to remove all traces of old RTV from the upper/lower oil pan meeting surfaces, and from the front/rear chain case meeting surfaces. And clean those surfaces thoroughly with brake cleaner to ensure good bond with new RTV. This takes mucho time, but there are no short cuts. A good gasket scraper is invaluable here. A putty knife or razor blade will just mar the mating surfaces.
- Installing the front chain cover after placement of the RTV is nerve-wracking! It takes a long time to lay the bead down on the perimeter of the case, and on the bolt-holes, and you also have to lay a bead on the top lip of the upper oil pan where the chain case cover rests. And RTV skins over in 5 min or so. There's no time to waste. I found it very helpful to practice setting on the front cover numerous times prior to applying the RTV. Get the feel of where to hold it without getting into the RTV; how to stand; how to drop it in smoothly & set it down correctly on to the two upper oil pan bolt holes (don't want to scoot it around & smear the RTV).
- In addition to the new oil gallery cover gaskets, best to install new crank pulley gasket into front chain case cover, and new gaskets beneath the cam sprocket timing covers.
- In my case, the chain tensioner shoe and guide shoe were in perfect condition. Not even scratched up. And the chain appeared not to be stretched (tensioner was no-where near fully extended upon first opening). So I didn't replace any of that. I was unable to find replacements for the three sealing rings on the cam timing cover snouts (that extended into the intake sprocket), so I just installed the covers with the old seals still in place. So far, so good.
- When reassembling, **BE SURE** to observe and follow the FSM bolt torque recommendations. I got in a hurry & failed to do that in a couple of instances, particularly with the chain tensioner assembly. That was a bad mistake! I just tightened it down what I thought was about right for 10 mm bolts. Turns out it is very sensitive to proper bolt torque. If too tight, it will bind the tensioner piston and not properly tighten the chain. After I got the engine assembled & running, I got a noticeable rattle/clank I finally decided was the timing chain. That didn't make sense cause I knew neither the chain, friction surface, nor tensioner were badly worn. Then I recalled I tightened the tensioner by "feel" rather than with a torque wrench. Checking the FSM, I realized it's only supposed to be tightened to 6 ft/lbs. I was sure I snugged it down more than that. So I drained the coolant, removed the fan, removed the alternator/PS pump/bracket, removed the serp belt & pulleys, and removed the RH valve timing control cover to check it. Sure enough, I over-torqued it. Corrected that, re-assembled, fired her up, and no more chain rattle. Do it right the first time!
- From beginning of tear-down to completion took me a total of 38 hours actual working time (working alone). I understand a pro could do it in 10-12 hrs. I don't see how.
- I was quoted at least \$1,700 + parts to do this job at an Infiniti shop. Just the O-rings/gaskets for replacement of the gallery gaskets alone cost me less than \$100. However, while I had it open I went ahead & replaced the water pump, rad hoses, clamps, serp belt, thermostat assembly, and all that plus the

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gaskets/o-rings and coolant/oil/filter, RTV, plus two tools I needed to do the job (chain wrench & seal cutter) ended up costing me a total of slightly less than \$400 in October, 2014.

- Oil pressure check following job found 22 psi at idle, and 52 psi at 2000 rpm (hot). And no coolant nor oil leaks have been found. So I think it was a successful repair (so far, anyway :).