

Here is the entire repair:

1. Remove airbox from filter to throttle body.
2. Remove six intake manifold bolts
3. Disconnect the throttle valve wire, all hoses attached to intake manifold, and remove the 10mm bolt on the drivers side that holds the EVAP purge solenoid to the intake. Then, carefully remove the intake.
4. Remove the two bolts for the lower plenum, but do not remove the plenum.
5. Remove all six coils, cut the tape holding the harness to the valve cover on the passenger side, and pry up in the plastic piece that is holding the harness to the cover on the driver's side.
6. Disconnect cam sensors and VVT solonoids and remove the holders from the valve cover
7. Remove the valve covers.
8. Remove the water outlet
9. Remove serpentine belt and water pump pulley.
10. Take the power steering reservoir off of its bracket and position the power steering pulley in such a way that you can access the two 13mm bolts that hold the pump to the bracket, and then pry the pump towards the driver's side with a bar to remove it from the bracket. Then, remove all bolts holding the power steering bracket to the block.
11. Now the fun part- Remove the three long bolts holding the A/C compressor to its bracket. You may need to access them through the wheel opening. Once they are removed, pull the compressor towards the front of the vehicle and remove the attaching bracket. There are bolts on both the side and front of the block that hold the bracket.
12. Remove the belt tensioner.
13. Remove the crank pulley. You will need a puller and you may have to get creative like I did with the puller above.
14. Remove all of the 13mm bolts that hold the front cover to the block, then remove the cover while being careful not to damage the VVT solenoids.
15. Put the cover aside.
16. Once you are able to access the timing chain(s), remove the passenger side cam chain by removing

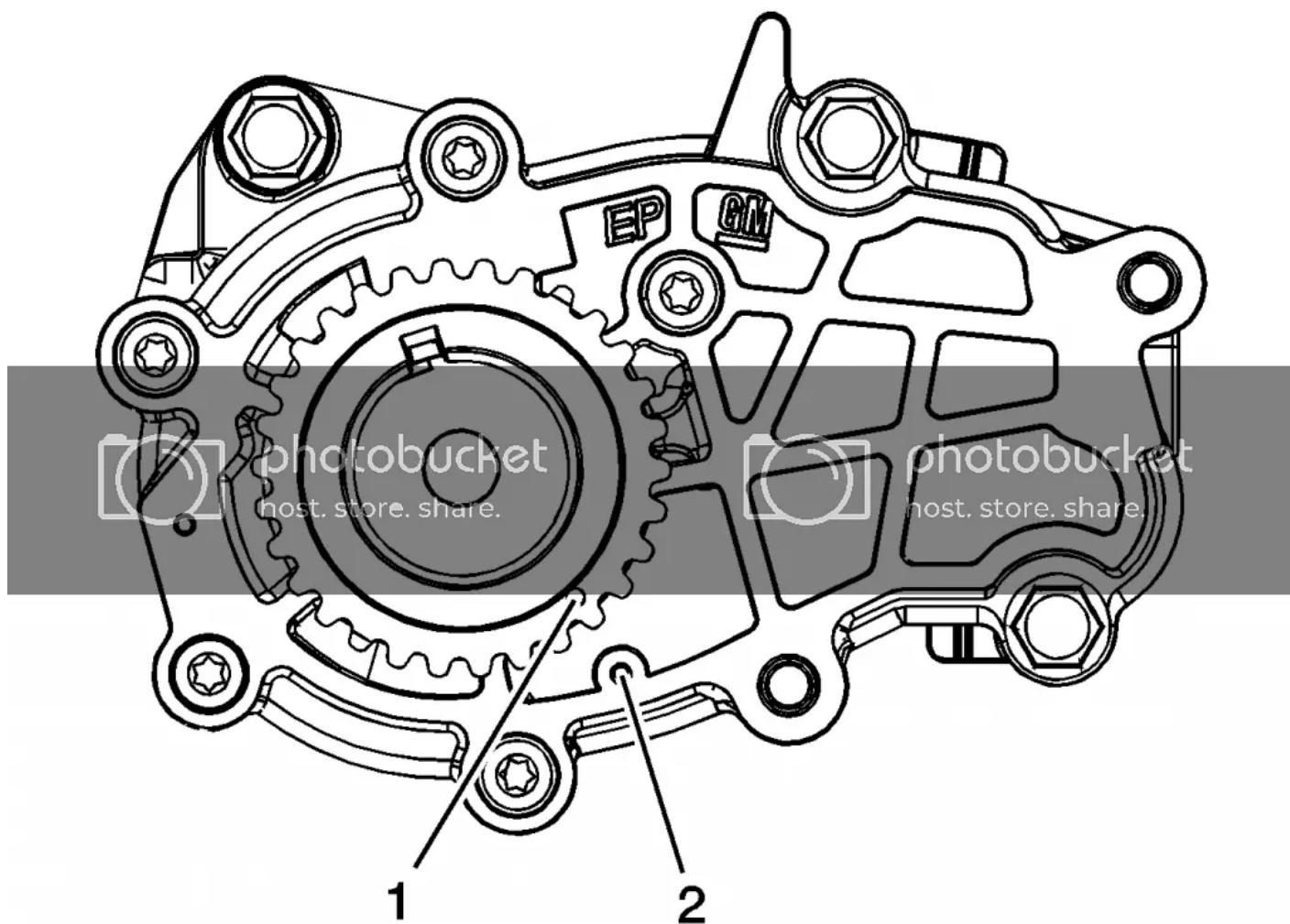
the tensioner. Then, remove the tensioner for the bottom intermediate chain. Remove that chain also.

Be very careful when the cams turn under spring tension You will get hurt if your fingers are not in the right place when they do.

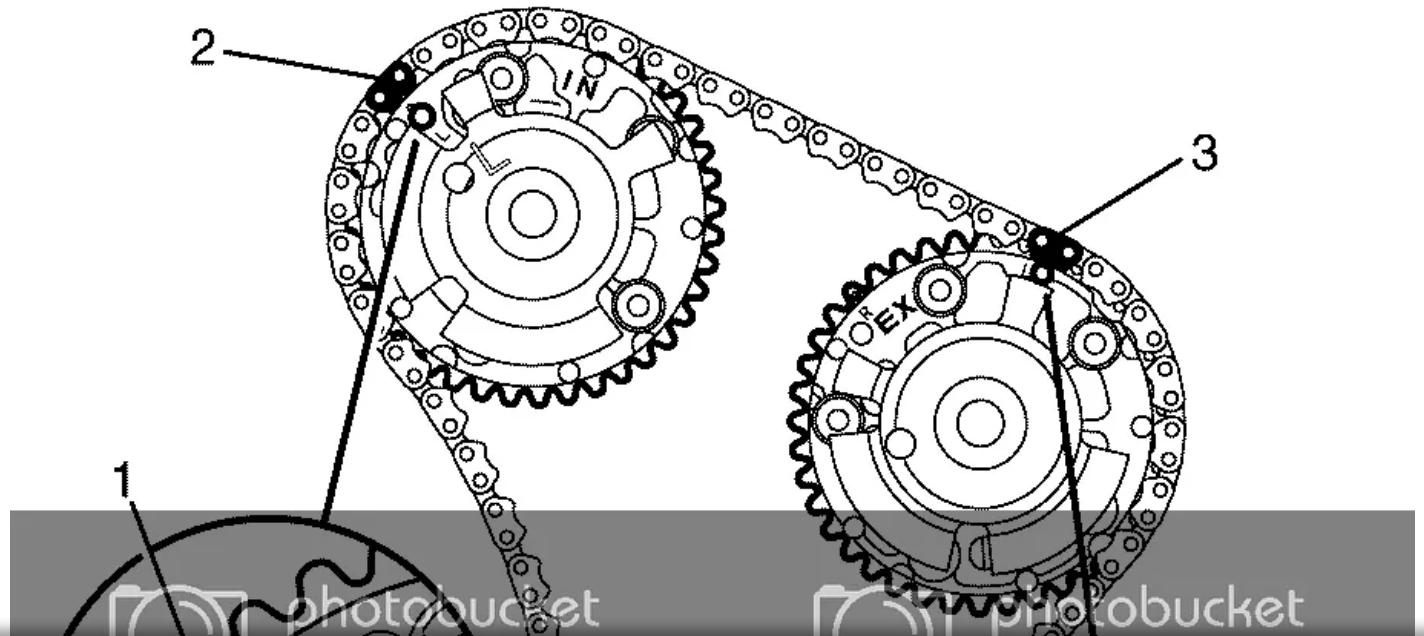
17. To remove the driver's side cam chain you must remove the tensioner and the guide that covers the chain.

18. Clean everything off with brake clean.

19. Make sure that the crankshaft is in the stage one timing position with the crankshaft sprocket timing mark (1) aligned to the stage one timing mark on the oil pump cover (2).

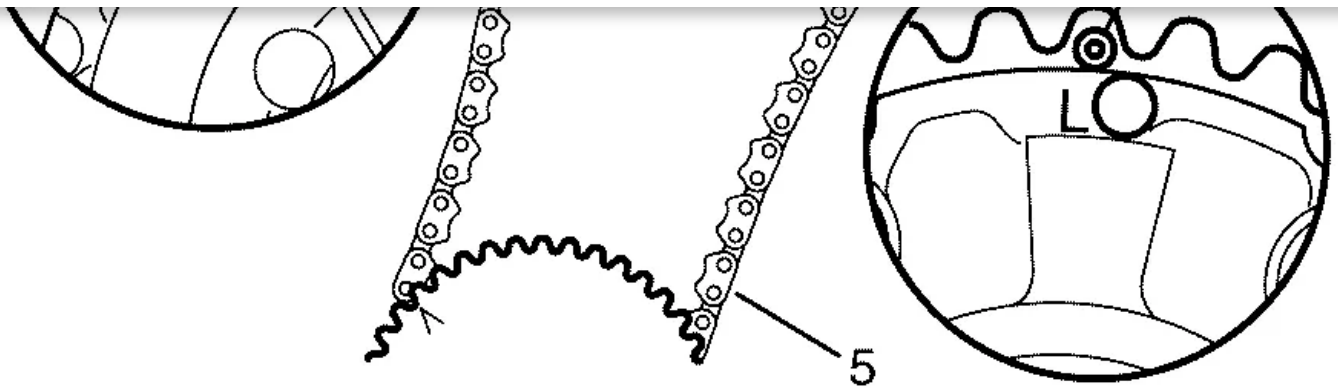


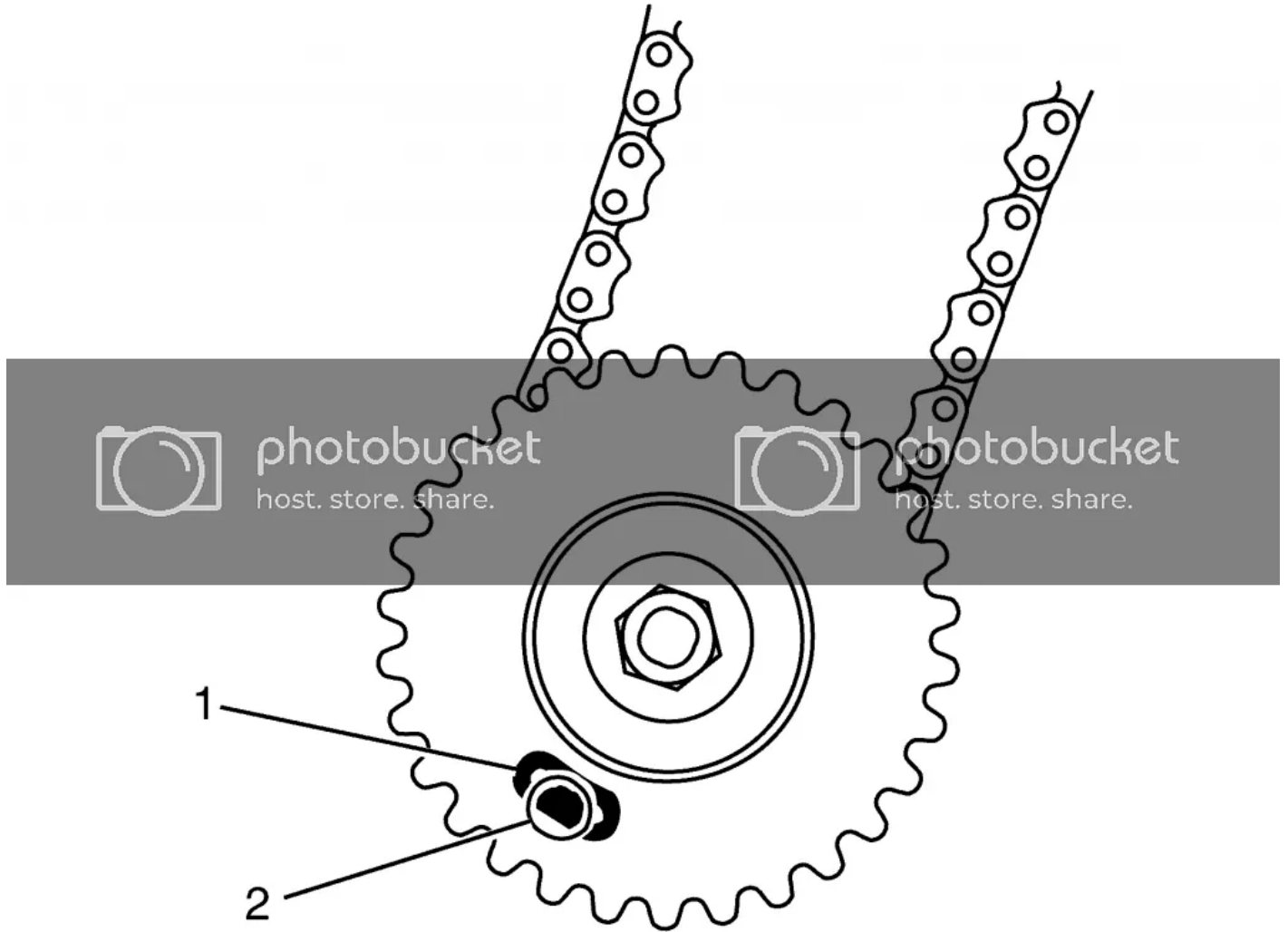
20. Install the chain such that the two small marks on the chain line up with the circle marks on each cam. The bigger mark on the chain lines up in such a way that if you were to look straight through the hole in the idler sprocket, you would see the mark right through it.



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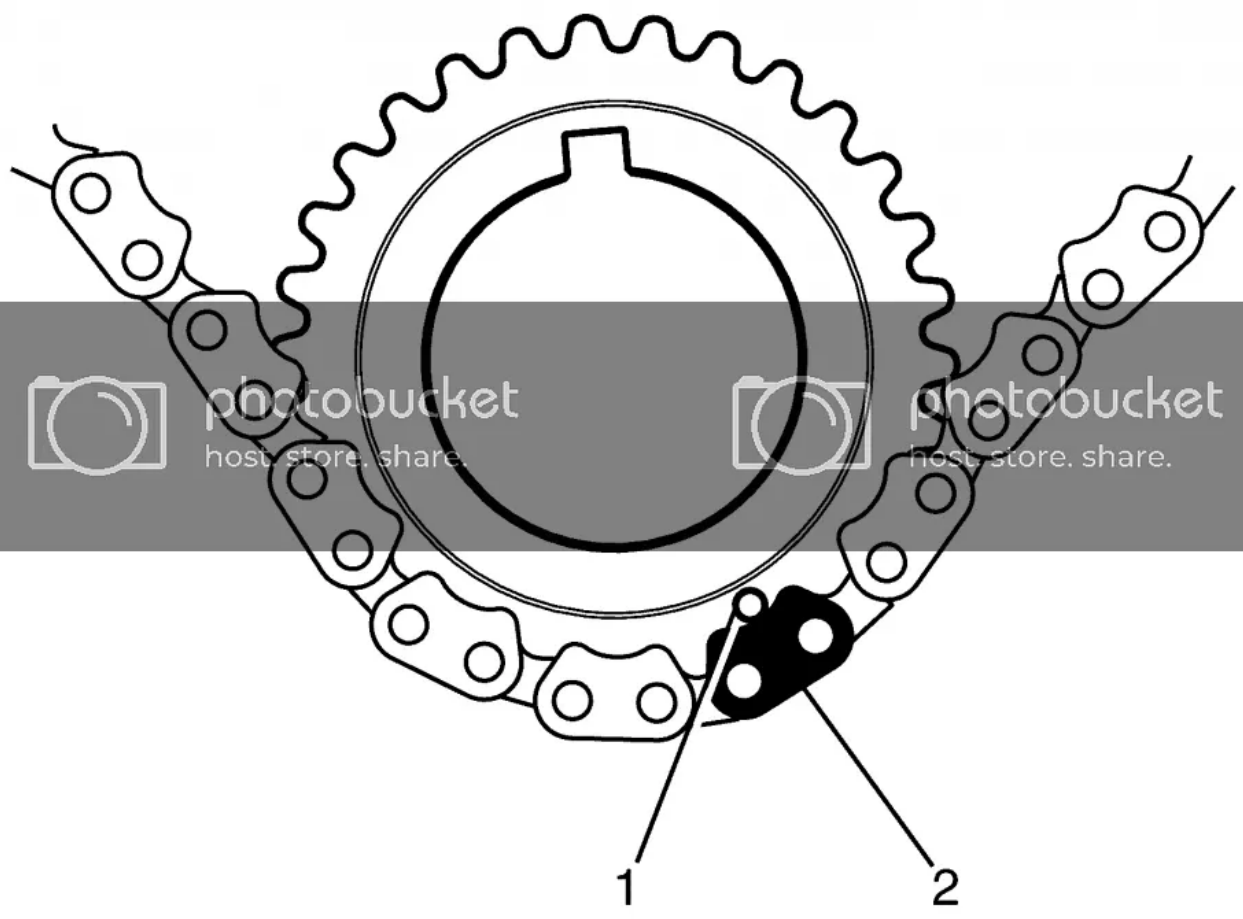


21. Install the tensioner.

22. Install the guide.

23. Remove the pin from the tensioner.

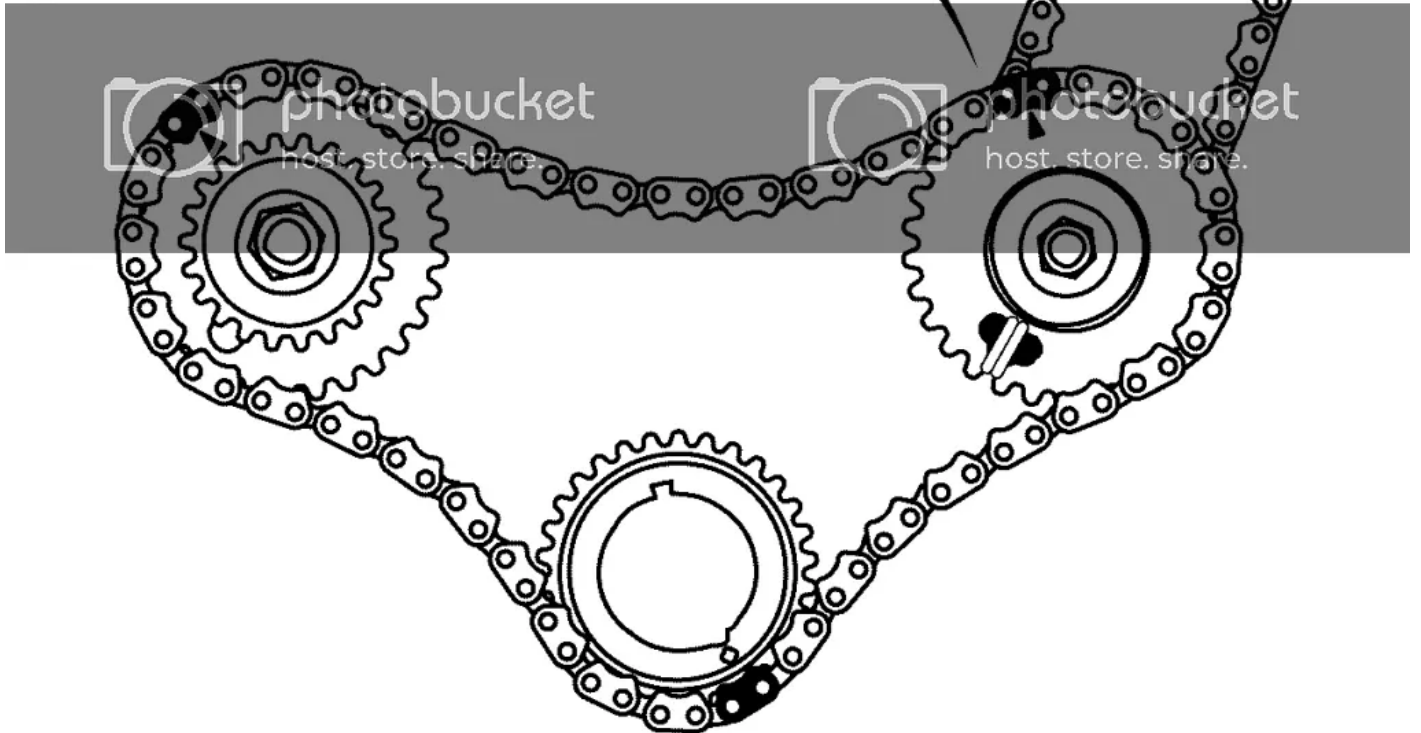
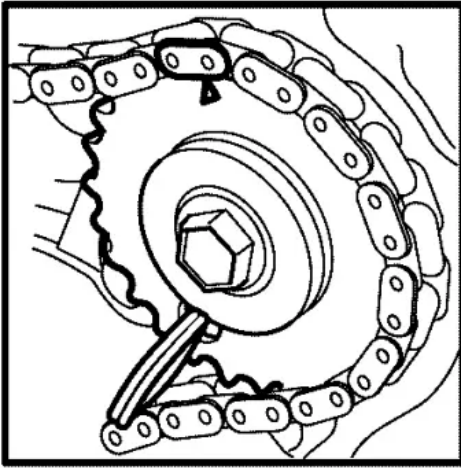
24. The intermediate chain is very easy. There are three marks equal lengths apart. With the engine still in the stage one timing position, install the chain such that the circular mark on the crankshaft sprocket meets up with a mark on the chain, and such that the other marks line up with the arrows on the idler sprockets. If the new chain is too tight to install, remove guides as necessary. Replace them once the new chain is on. Then install the tensioner and remove the pin.



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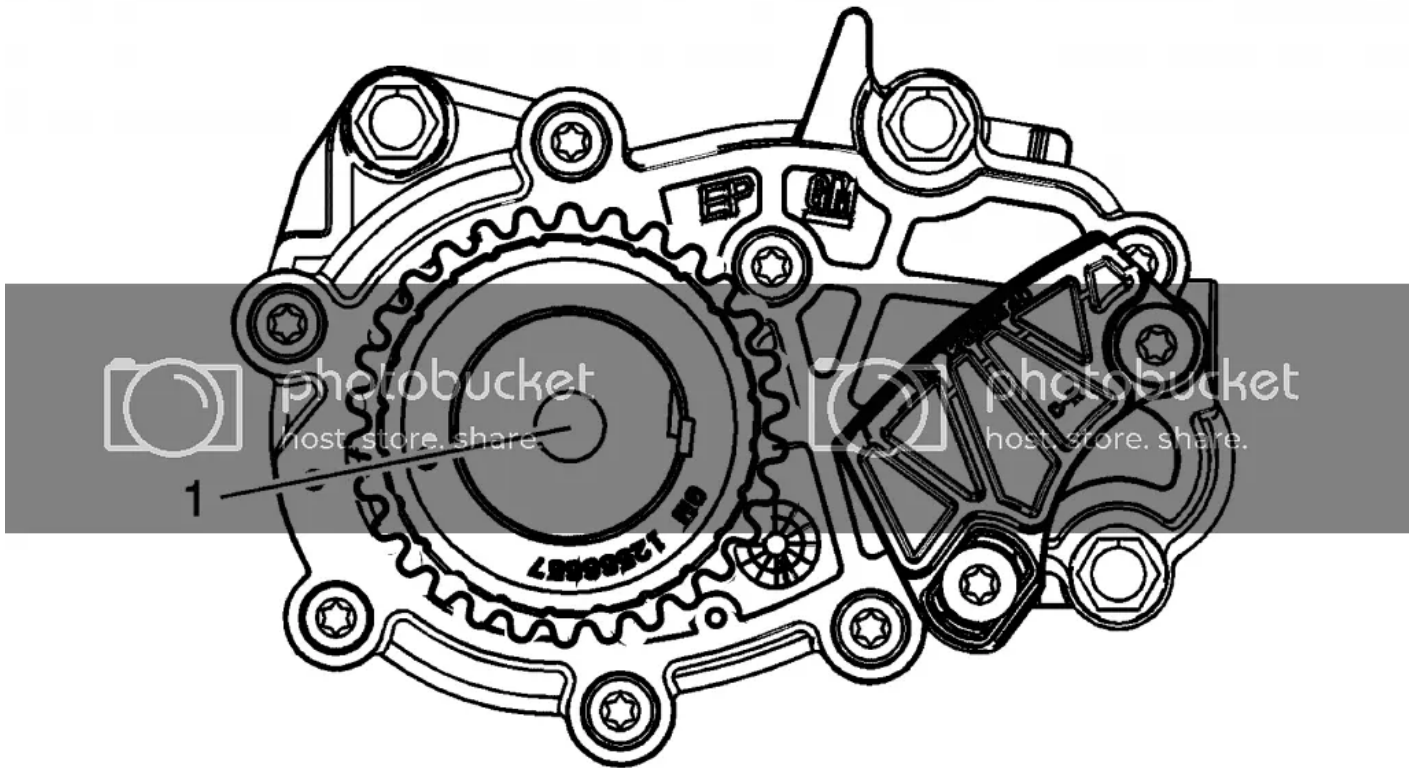


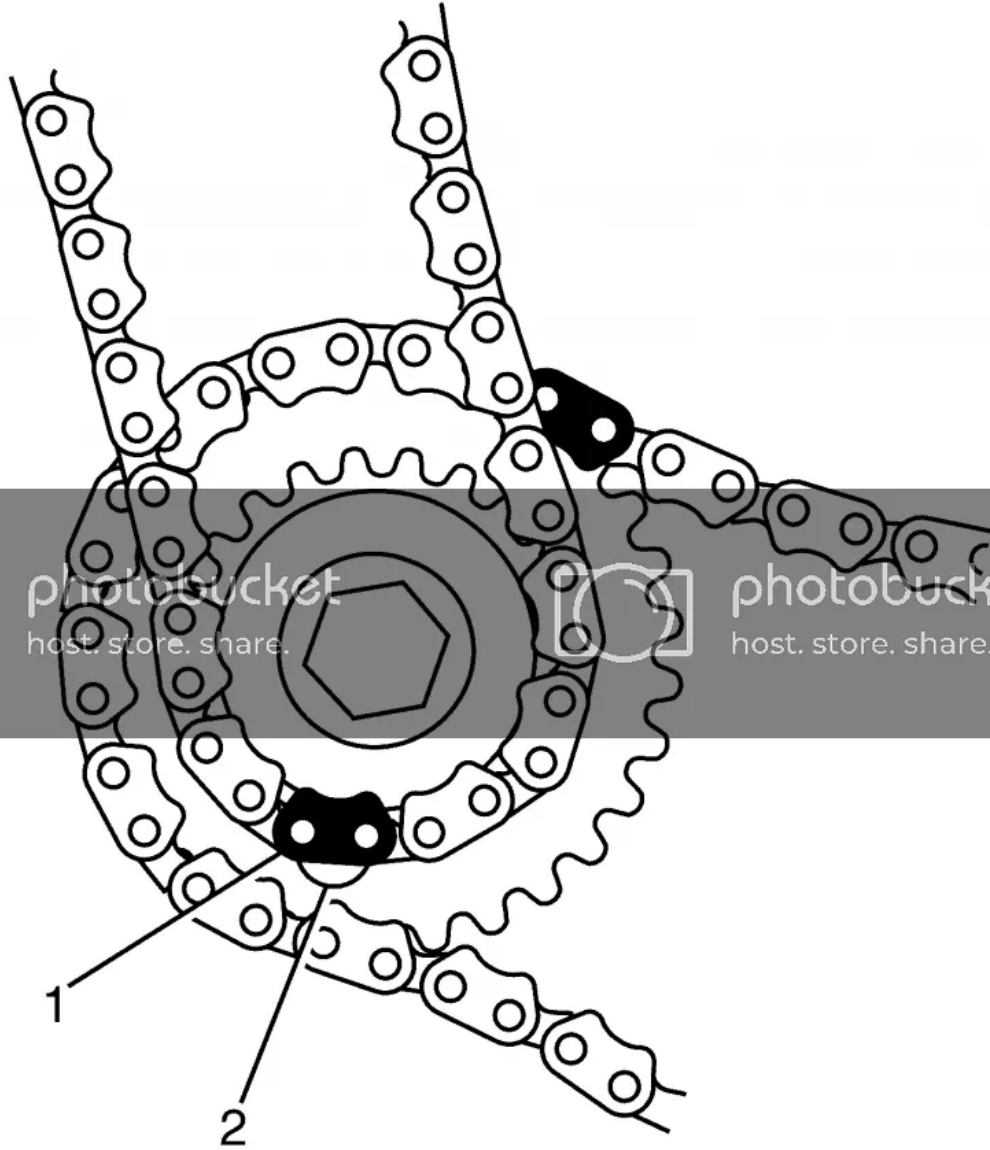
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25. Now we must move the engine to the stage two timing position which is as displayed below:

26. Install this chain such that the two smaller marks meet up with the TRIANGLES on the cam sprockets. Please note we are NOT using the circles on this side. Install it on the idler so that the mark is in line with the hole in the larger sprocket. On this side it is hard to see, but do your best to make sure it is perfectly lined up with the hole. Install the tensioner and remove the pin.

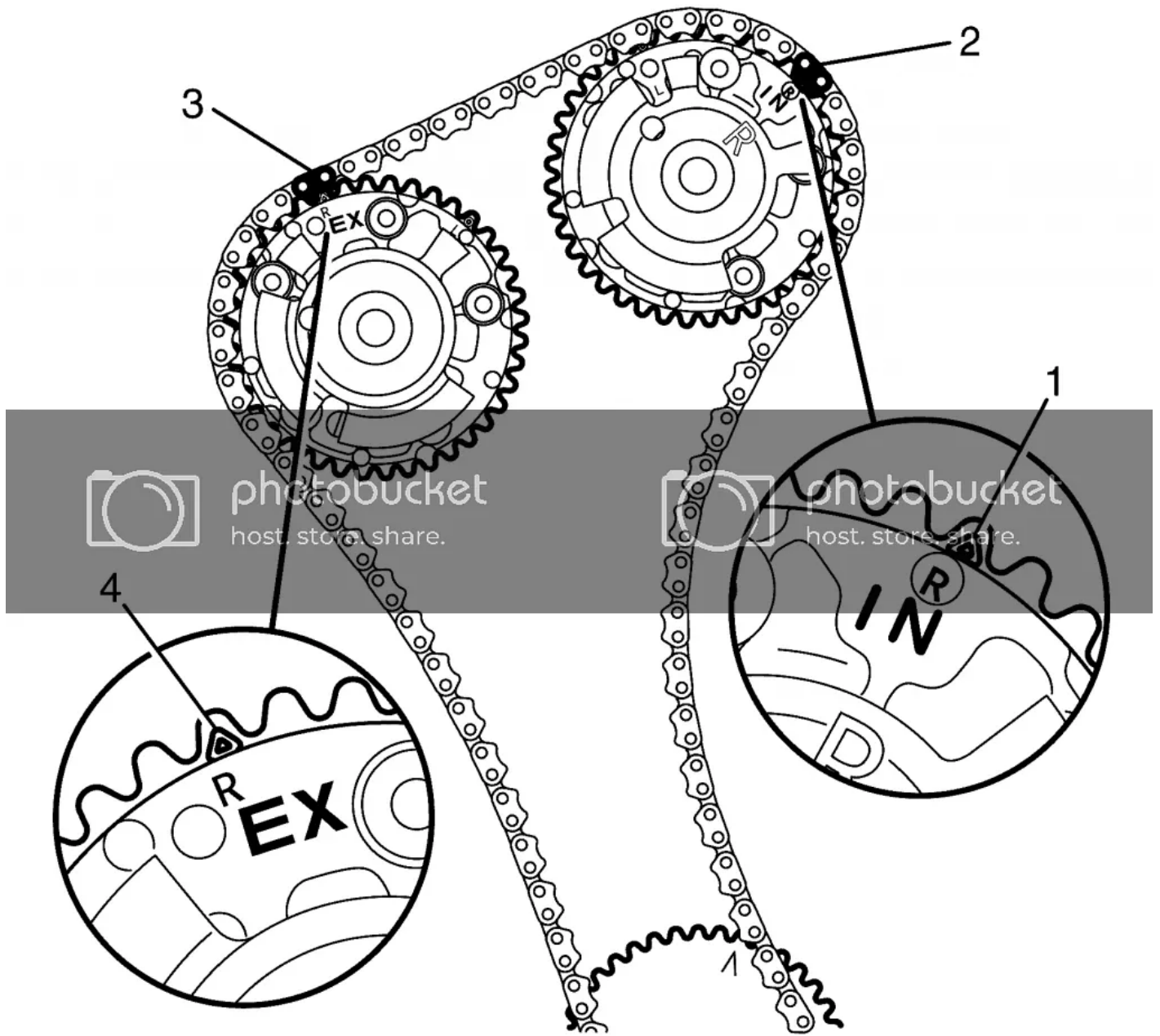




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27. Rotate the engine several times by hand to make sure it is not binding by interference of the valves and the pistons. If it feels good, then you are in business.

28. Clean the timing case cover and remove the VVT solenoids. These are the long solenoids that protrude into the block from the cover. Also, remove the water pump seal and the engine front seal. Replace them with new ones. You may also replace the VVT solenoid seals, but I did not and they did not leak. If they do, it is easy to do it afterwards.

29. I recommend using Permatex anaerobic sealant to put between the timing cover and the block. I also applied it liberally to the water pump seal. The last thing you want is water in your oil.

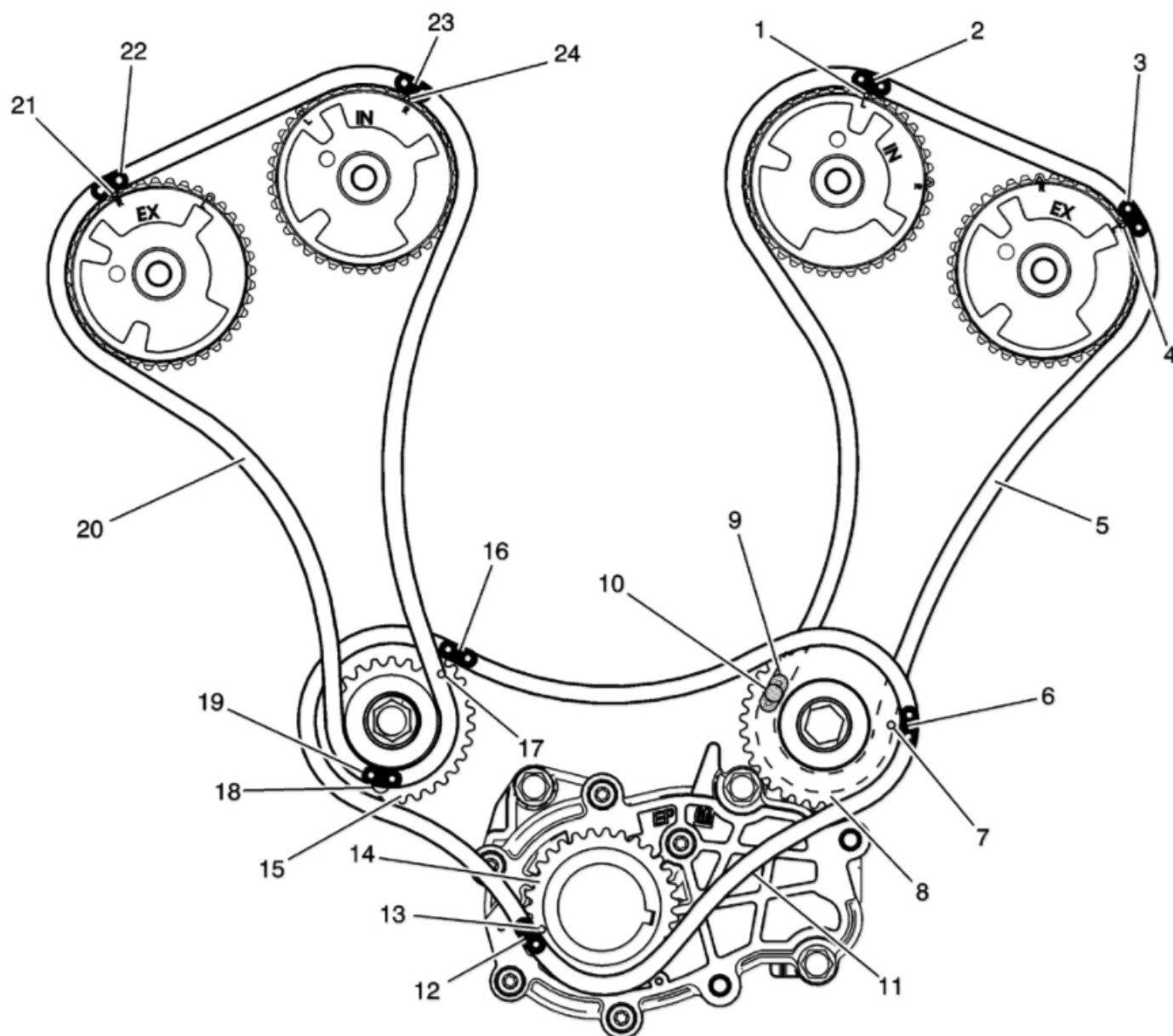
30. Install the cover. Because we didn't remove the alternator, you may have to give the cover a small tap with a hammer on the side of the alternator.

31. Install your VVT solenoids and reverse the entire disassembly. You may want to apply anaerobic sealant to the seals of the water outlet where they meet the block.

32. MOST IMPORTANT STEP: CHANGE THE OIL BEFORE STARTING THE ENGINE. As you take the timing cover off, all the coolant goes into the oil pan. You will need to drain it all out and fill it with new oil and replace the filter. You then will need to replace the coolant that was lost.

33. Start the engine. Hopefully it will sound happy. Then road test the car.

Fig 65: Stage Two Component View



Courtesy of GENERAL MOTORS CORP.