

© D. Jensen 2006	<b>REPLACEMENT OF V8 SECONDARY TIMING CHAIN TENSIONERS</b>	V. 1.0 June 2006
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*The Fine Print: The following is a summary of my experience replacing the secondary timing chain tensioners on my California-based '01 XK8, VIN NA11439, with 53,500 miles. Some of the steps described may not be applicable to your car due to its year of manufacture or other details, although I believe it is generally applicable to 4.0L V8s. I have worked on cars for many years so I have a reasonable understanding of their operation and safety issues that must be addressed. I accept no responsibility or liability for potential misstatements in neither this write-up nor the manner in which the write-up is used. Please follow all normal safety precautions when performing this work.*

My '01 XK8 came from with factory with the "Rev. 1" secondary timing chain tensioners, i.e., those with the helper spring. However, with introduction of the "Rev. 2" metal-bodied tensioners, coupled with comments that the Rev. 1 tensioners can fail without the accompanying rattle as a warning, I decided to install the Rev. 2 version (see Sunny Garofalo's Jag-lovers X300 posting of Jan. 7, 2005, "Timing chain tensioner – definitive answer?" for pictures of each design). I elected not to replace the primary tensioners or any of the chains given the relatively low mileage of the car and the significantly greater amount of work involved in doing so.

I reviewed the Jag-lovers archives and found several excellent descriptions, including one on this web site, with many photos. These provided an excellent starting point, but generally addressed change out of both the primary and secondary tensioners and chains. As such, I followed the detailed procedure described on the Jaguar JTIS CD and by ALLDATA (they are the same) for replacing just the secondary tensioners and referenced the other Jag-lovers write ups as needed. I took photos and made notes that supplemented the JTIS/ALLDATA and Jag-lovers descriptions, as presented below.

### Special Tools

As has been noted by many others, several special tools are required to replace the tensioners. I reviewed Jag-lovers posts where members described how to make the tools at home. I spent a lot of time looking at the photos, deciding how well the tools would work, and how much time/effort on my part it would take to fabricate them. In the end, I decided to forgo making my own tools and purchased them from Motorcars LTD (see Fig. 1) and Sears.

The most important tool, in my judgment, is the Camshaft Valve Setting Lock Tool (\$125; see Fig. 1) (the 6-in. ruler is there to show scale only). I was not convinced that a homemade tool that I could make would preclude the cams from rotating as the sprockets were retorqued following tensioner replacement. I believe this is important since the V8 camshafts and sprockets are not splined as they are on earlier Jag engines. The Jag tool really locks the cams in place, with no uncertainty as to their alignment. Note that I did not buy two locking tools since I was replacing the tensioners one side at a time and thus did not need to lock both sides simultaneously.

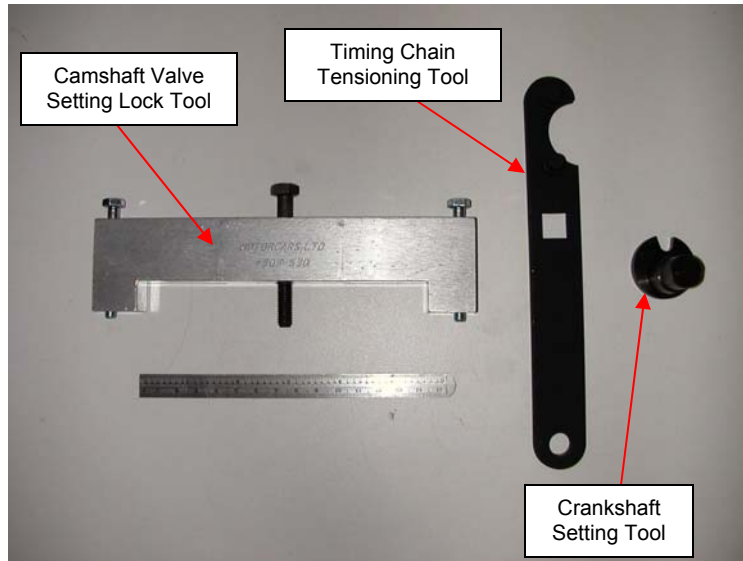


Fig. 1 Special tools

I also bought the Timing Chain Tensioning Tool (\$75) and the Crankshaft Setting Tool (\$50). While I was pretty certain I could fabricate a tool like the tensioning tool as others have done, in the end I decided for \$75 to just save myself one or more trips to Home Depot and the time to fiddle with getting it right. Note the square opening in the handle for a 1/2-in. breaker bar used to provide counterforce during freeing and retorquing of the sprocket-to-camshaft bolt.

I am not certain if the Crankshaft Setting Tool is really necessary when replacing only the secondary tensioners, but since the instructions call for its use, I decided to go ahead with it as well. It provides for very precise positioning of the crankshaft. While a screwdriver or short length of pipe may serve this purpose, I doubt they could do so nearly as well as this tool.

The other tool described in the instructions is a 10-mm, ball-ended, hexagon drive bit, available from Snap On for ~\$30. Since I happened to be near Sears before starting this work, I checked to see if they had a comparable tool. Not surprisingly, they didn't, but they did have a hex key (\$5) (see Fig. 2). I merely cut off the "L" portion of the wrench and used a 10-mm socket to drive the hex. It worked great. Note that a flat-ended hexagon drive vs. ball-ended drive will not work when changing only the secondary tensioners. It might work when replacing the chains and primary tensioners where removal of the timing ("engine front") cover allows straight-on access to the cam sprockets. However, when doing the secondary tensioners only, this is not the case. The hexagon drive enters at a slight angle due to the presence of the timing cover, enough so to require the use of the ball-ended drive.



Fig. 2 Craftsman 10-mm ball-ended hex key

## Parts

I purchased the two Rev. 2 tensioners (\$236) (note that they are mirror images of each other, i.e., they have unique part numbers) and all of the necessary gaskets and seals (\$165). As it turned out, I was able to return the gaskets and seals because they had all been replaced 15 months earlier and were in excellent condition. It is also fairly easy (certainly more so than on my V12!) to replace them if an oil leak develops.

## Disassembly

Figure 3 shows the right-hand side of the engine compartment before the start of disassembly. The arrangement of the air filter and duct seems very similar to that of the X308 XJ8 and was removed easily in accord with the instructions. I found that a long screwdriver was helpful in disconnecting the two inboard clips helping hold the air-cleaner cover in place. As may be apparent from Figs. 3 and 4, it was also necessary to remove the air-cleaner housing in its entirety to provide access when working on this side of the engine. A helpful hint is that the air-inlet duct can be loosened from and pushed into the air-cleaner housing by squeezing two tabs on the duct. This simplifies removal of the housing.

The instructions state “Release the clips which secure the engine harness to the cam cover”. There are several of these on each cam cover and I found the ones at the front and rear nearly impossible to push out of the covers. I sidestepped this by cutting the black plastic tape holding the clips to the wiring harness and reattached them during installation with small, black tie-wraps.

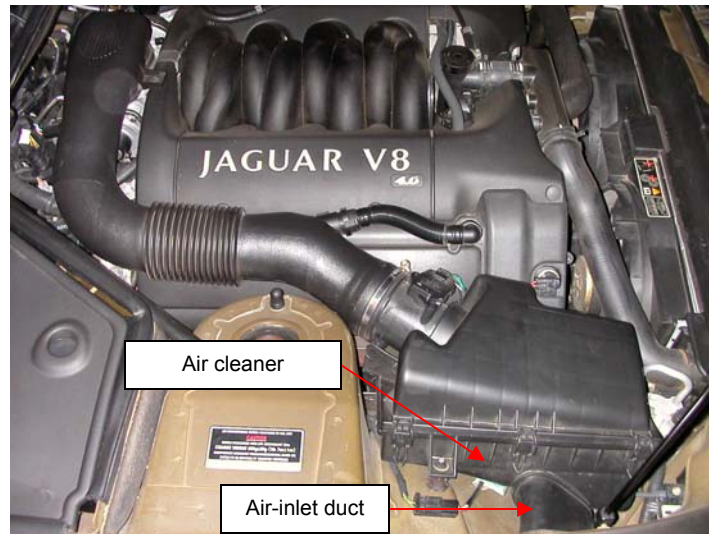


Fig. 3 Right-side view of engine bay with air filter and intake tube in place



Fig. 4 Right-side view of engine bay with intake tube and right-side engine cover removed. Note the air filter and body are still in place.

Figure 5 shows the left side of the engine bay with the engine cover, coil-on-plug cover and oil dipstick removed. I had no difficulty removing the 8-mm nut holding the oil-level indicator tube to the cam-cover stud, but I could not wiggle the tube free from the engine. I chose to let it remain loose versus work to remove it entirely.

Removal of the cam covers was straight forward on both sides, as per the instructions. I had both covers off in ~2 hours working at a leisurely pace. I then installed the Crankshaft Setting Tool. Again, the instructions are very clear. I removed the 30-mm Torx bolt holding the crankshaft position sensor in place. The only point where the instructions weren't consistent with my car was that there was no "Δ" on the drive plate as shown in Fig. E37499 in the instructions. Note that the timing slot on the drive plate must be dead on for the tool to drop into place. It took me about 10 minutes to get the alignment right.

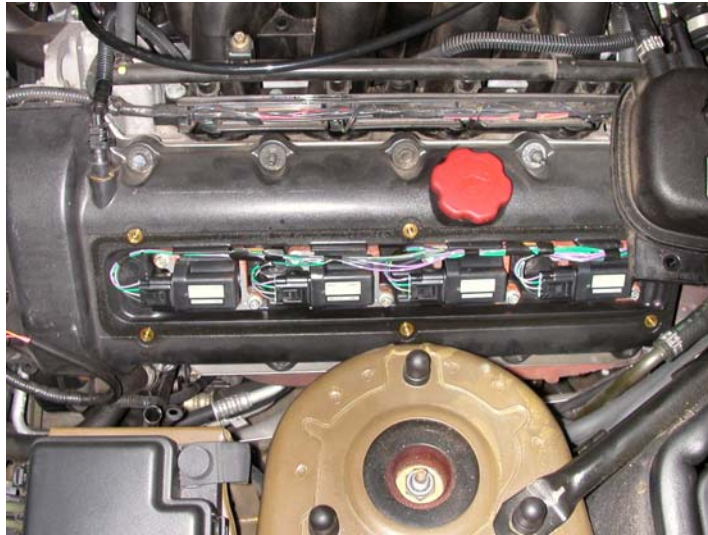


Fig. 5 Left side view at start of disassembly

Fig. 6 shows the right side of the engine after installation of Camshaft Valve Setting Lock Tool and 10-mm ball-end hex driver. As per the instructions, I first attached a short piece of metal plate to the timing cover, taped in place, to prevent damage to the timing cover/cam cover mating surface. While not obvious in the photo, the hex driver enters off center a few degrees. Note the rag stuffed into timing chain cover to avoid potential disaster.

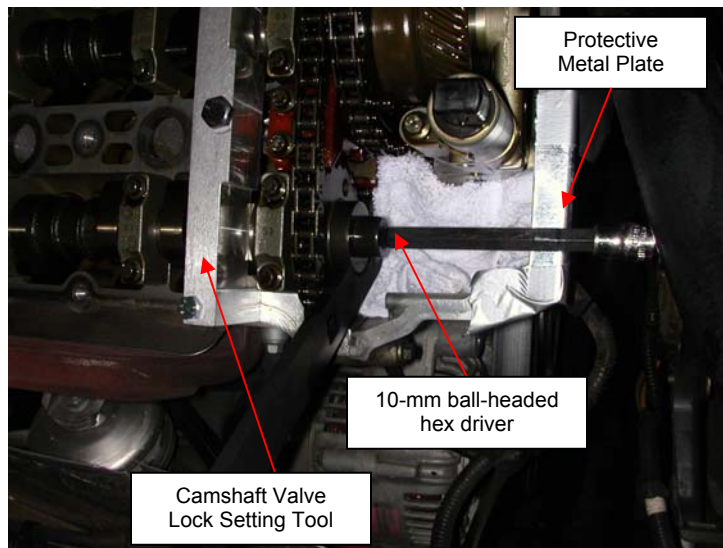


Fig. 6 View of right side with camshaft setting tool, 10-mm ball-end hex driver and protective metal plate in place

As shown in Fig. 7, I used a ½-in.-drive torque wrench and ½-in. breaker bar, inserted into the square opening in the Timing Chain Tensioning Tool, to loosen the bolt securing the sprocket to the camshaft. This is a long bolt that, surprising to me, is hollow (per a local Jag specialist I deal with). Figure 8 shows the sprocket as it was nearly off of the camshaft.



Fig. 7 Torque wrench, Timing Chain Tensioning Tool and breaker bar in place during removal of sprocket-to-camshaft bolt

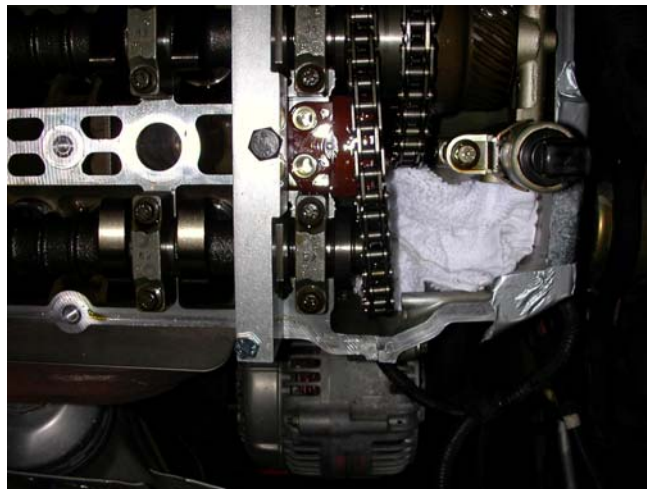


Fig. 8 Sprocket moved forward off of camshaft

Once the sprocket was off the camshaft, it was a fairly simple matter to remove the tensioner after the two hold-down bolts were removed. Reinstallation was likewise simple. Note that the tensioner bolts only need to be torqued to 10-14 Nm (7.4-10.3 ft-lb). This isn't very much. I used an in.-lb torque wrench to get it right. Even so, one bolt on the right side seemed to continue to yield slightly above 10 Nm. I opted to put a bit of Loctite on it and torque it to 10 Nm only.

Retorquing the sprocket to the camshaft requires 115-125 Nm. It was at this point that I was glad I had the Timing Chain Tensioning Tool and breaker bar since this is a fair amount of torque to apply, especially when the hex does not drive straight on. I found it useful to carefully follow the instructions re alignment of the holes on the sprocket to allow installation of the Timing Chain Tensioning Tool and torquing of the bolt.

I had one experience that I thought was a problem, but turned out not to be. After finishing both sides, I rechecked the right side and noted there was slack in the secondary chain. I began to think that somehow I had made a mistake when torquing the sprocket-to-camshaft bolt. I then reinstalled the Camshaft Valve Lock Setting Tool to repeat the operation, only to discover that the chain tension returned to the snug feeling as the cams were properly realigned. After breathing a sigh of relief, I proceeded to replace the cam covers and other items.

Figure 9 shows the new tensioner in place

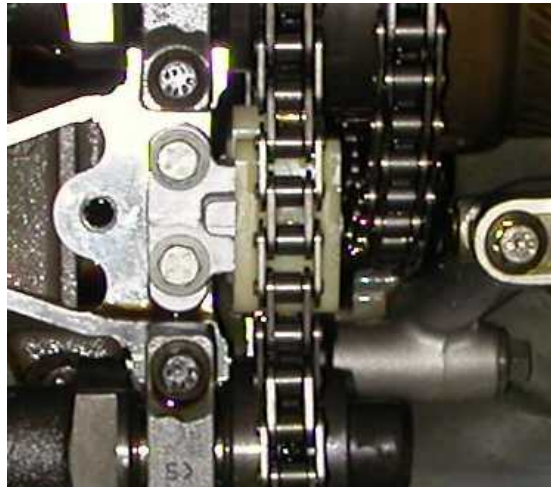


Fig. 9 New tensioner in place

The final question: were my tensioners cracked? A look inside the engine showed it was extremely clean, reflecting the frequent oil changes it has had. It also has not had any overheating issues. The tensioner plastic was reddish-brown, as is characteristic of all used-tensioner pictures I have seen. Surprisingly, there was little wear on the slipper pad, as shown in Fig. 10. I don't know if the left tensioner was cracked or not since it broke during removal as I tapped it lightly with a hammer to loosen it. However, the right one was definitely cracked, as can be seen in Fig. 11. For comparison, I have seen tensioners at my local Jag specialist that were much worse than this on other, higher-mileage V8s.



Fig. 10 Slipper surface showing minimal wear

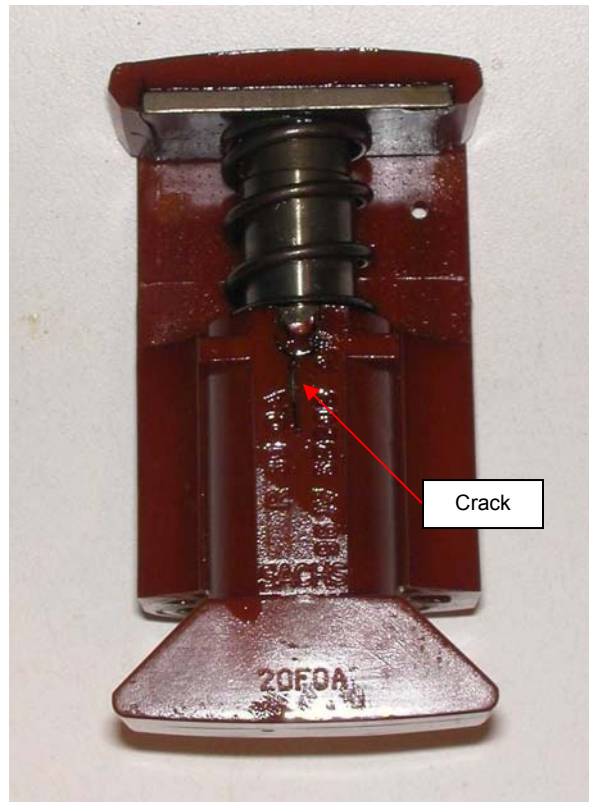


Fig. 11 Right-side tensioner showing crack

To me, the time (~7 hr) and money (\$500) were worth the effort and accompanying peace of mind. My local Jag specialist charges \$800-900 for this work. The difference of \$300-400 would seem to make doing this myself or having them do it a push. However, I have the satisfaction of knowing how to do this when needed again on this or another Jag V8 in the future.