German Time

Mercedes Timing Chain

In December's article describing thread repair procedures on Mercedes aluminum block V8 engines, we promised you a follow up article on timing chain upgrades for Mercedes V8 engines originally equipped with single row timing chains.

From 1981-1983, the 107 (380SL) and 126 (380SE/SEL) Mercedes-Benz model cars were equipped with the 116.96 3.8L overhead cam aluminum V8 engine. These engines were equipped with a single row timing chain and gears. The design was certainly lighter, and possibly quieter than a double row chain. But problems developed as some of the single row chains on neglected engines began to break.

The Benz V8 is not a free-wheeler, and a broken chain means internal engine damage, including the possibility of bent valves, bent rods, damaged cylinder heads and rod bearings, and broken pistons.

As a follow up to our earlier article describing the installation of thread inserts in these engines (see "Drill and Tap," December 1990 *Import Service*), we will show you how to modify these engines by installing a double row timing chain and gears. The same basic procedures will also apply to replacement of chain, guides, sprockets, and front cover seals on Mercedes V8 engines clear back to the old cast block 4.5 liter.

We should mention that replacement of a worn double row chain can be done without removing the front cover. We'll give you basic procedure, and a caution here:

- **Remove the right rocker cover and chain tensioner.**
- **Grind off one link pin from the old chain and remove a link pin to separate the old chain. Hold on to both ends of the old chain.**
- **Attach the new chain to the old chain using the master link provided with the replacement chain. (Some replacement chains have a master link, some don't.)**
- **Pull the tensioner side of the old chain tight against the right cam sprocket and rotate the crankshaft to let the old chain draw in the new one. Old and new chains work together to keep cam, crank, and distributor sprockets turning in synch.**
- **When the new chain is drawn all the way through the engine, unhook and discard the old chain. Then connect the two ends of the new chain using the master link.**
- **Install the link pin lock with the closed end facing the direction of normal engine rotation.**
- **Replace the valve cover.**

The caution: If the chain is badly worn, or if the engine shows signs of neglect, this method does nothing to correct sprocket and guide wear hidden in behind the timing cover. Some of the photos in this sequence are of a 3.8 aluminum engine, some are of an old cast block 4.5. As you'll see, the similarities are remarkable, as are the repair procedures for both.

Same Engine, Different Cars

There are a number of ways to attack the upgrade modification, depending on the Benz model in your stall. SL's will cause you the most trouble. If you try to do this modification to an SL with the engine installed in the car, you'll find that the crossmember blocks removal of the one piece oil pan. That means dropping the front crossmember and suspension, and supporting the engine from above with a front wheel drive type engine support.

The 126 car has a two piece oil pan. The lower section of the pan can be removed (to facilitate oil pan removal) with the engine and crossmember in place. But the upper section of the oil pan must still be removed and rested on the crossmember before you can remove the timing cover. My personal choice, and the choice of most Benz techs I know, is to remove the engine from either of these vehicles. By the time you remove all of the accessories (lines, belts, and hoses) so you can get at the front cover, you're not that far from having the engine out of the car.

Torque Specs	
Crankshaft Damper Bolt	270-330 Nm
Timing Cover Bolts	22 Nm
Oil Pan Bolts	11 Nm
Camshaft Bolts	100 Nm
Valve Cover Bolts	3 Nm

Mercedes-Benz Part Numbers

Quantity	Description	Part Number
1	Chain	000 997 75 94
2	Cam Gears	116 052 06 01
1	Intermediate Gear	116 050 05 05
1	Chain Tensioner	116 050 18 11
3	Woodruff Keys	006 888 004 002
1	Distributor Gear	116 150 08 12
1	Lower Pan Gasket	116 014 05 22
1	Water Pump Gasket	117 201 00 80
1	Chain Rail	117 050 18 16
1	Chain Rail	117 052 10 16
3	Chain Rails	116 052 17 16
1	Crankshaft Gear	116 052 03 03
	Valve Cover Gaskets (L/R)	116 016 05 21 116 016 06 21
2	Timing Cover O-rings	009 997 89 47

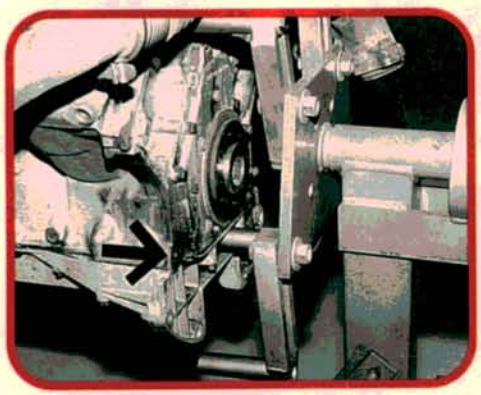
An Ounce of Prevention

As mentioned earlier, the time to do this modification is before the chains break. When servicing these cars, it's a good idea to pop off a valve cover, and check to see if the cam chain is a single or a double roller. If it is a single row chain, talk to the owner, and explain what happens when the valves stop, and the pistons keep on pumping. This particular engine had 130,000 miles on it, all with the original single chain. Gears showed heavy wear, and one chain rail had broken from chain slap. But customer neglect and hard driving have contributed to the early death of some chains.

If the chain has already broken, you'll need to remove the heads and check the damage. The Helicoil procedure described in our earlier article must also be considered as a part of the procedure once the heads are removed.

This article will look at an upgrade of a specific engine with a single row timing chain system that hasn't broken yet. That means we don't need to remove the heads.

—By Paul Airoldi



1

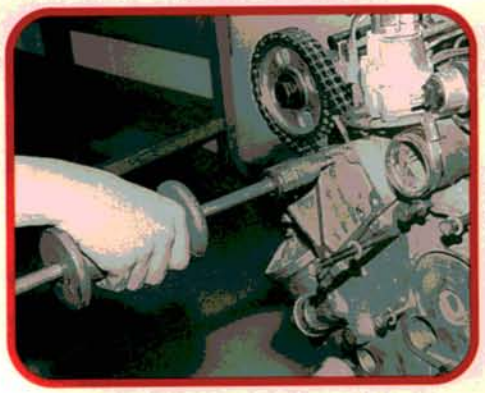
Remove the flywheel and lay it aside. Mount the engine on a stand. Bolt the engine to the stand as shown, but don't bolt the stand to the oil pan, since we need to remove the pan. The bolt hole just above the pan (shown by our arrow) is a good fastening point, and won't interfere with pan removal.

2

Set the engine to TDC on Number 1 cylinder, and leave it there. If we don't move anything as we remove the old chains and sprockets, setting up the new ones will be a breeze. Remove the distributor cap and mark the position of the distributor rotor before removing the distributor.

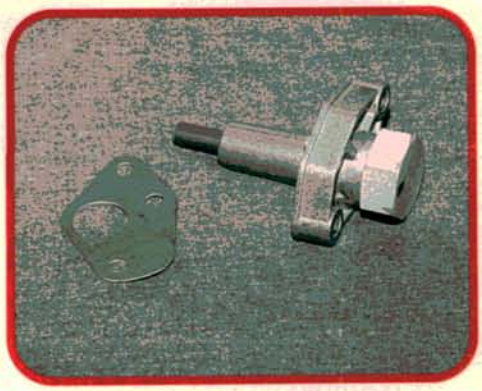
3

Remove the water pump and valve covers. On high mileage engines, camshaft oilers should be removed and replaced at this time as a maintenance procedure. (See photos 1 and 2, "Drill and Tap," December 1990 *Import Service*.) Double check to be sure the marks on the cams are properly aligned.



4

Remove the four chain rails below the cam sprockets (two per side). Benz holds the rails in place with press fit pins. Each pin has a 6 mm x 1.00 mm threaded hole for use with a puller. These pins can be corroded, however, and in this case, our larger slap hammer does a better job than the smaller factory tool.



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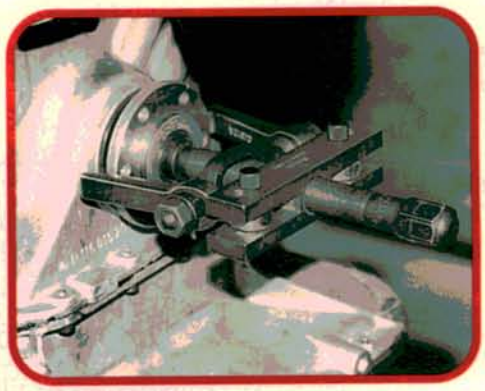
Remove the chain tensioner. Since the type of tensioner used with either chain is the same, you might be tempted to reuse the old one, but it is not recommended. (Tensioners are oil fed, so don't panic if you get a few seconds of chain slap the first time you start the engine with a new tensioner.)

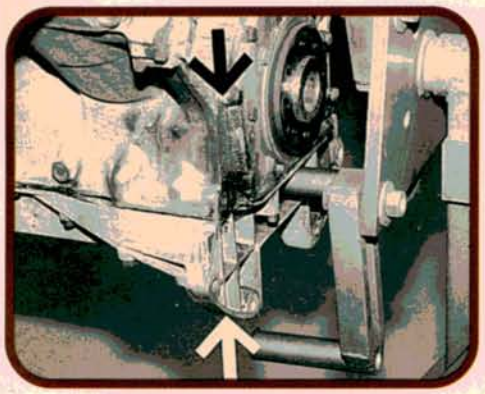


6

Remove the front damper using a standard puller. Match mark the crank and damper to ease reinstallation since the woodruff key is set far in and out of sight. Once the damper is removed, remove the crank seal to ease removal of the oil pump chain. (We'll get to that part in a minute.)

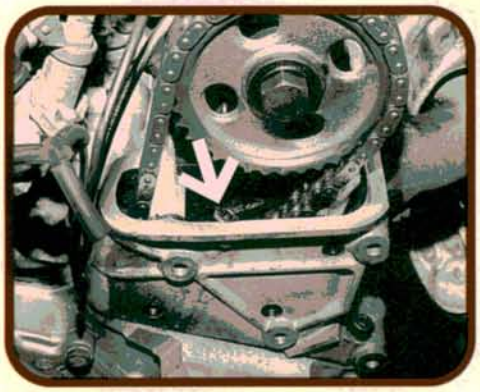
7

Remove the lower part of the oil pan (on this 126 car). This will expose the oil pump. Release tension on the oil pump chain by removing the spring retaining bolt (arrow). Unbolt the pump and remove it by tilting it forward until the chain clears the pump sprocket. Note how the spring is installed, and don't lose it.



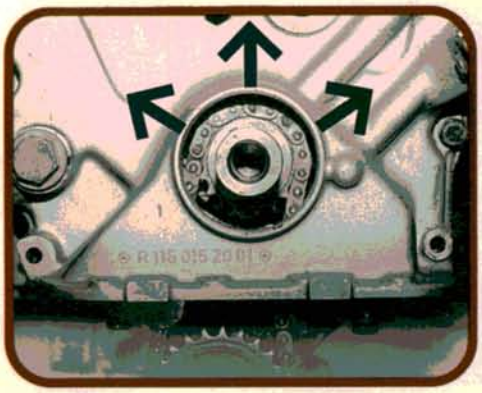
8

Remove the upper oil pan to remove the front cover. Later, when reinstalling the upper pan, the rear edge of the pan and block must be flush, or the bell housing won't sit flat and you may end up with noise and vibration. Always replace pan gaskets no matter how good the old ones look.



9

Finally, it's time to remove the timing cover. There are a few trick parts here, so we'll go over them carefully. First, don't forget the 5 bolts that screw down through the front of the heads into the cover, (3 on one bank, 2 on the other). One bolt on each side is inside the head.



10

The oil pump chain passes through a channel in the front cover. Lift the chain away from the sprocket and place a curved piece of thin sheet metal between the sprocket teeth and chain to keep the chain from falling back on the sprocket. That way the chain will slide off with the cover.

11

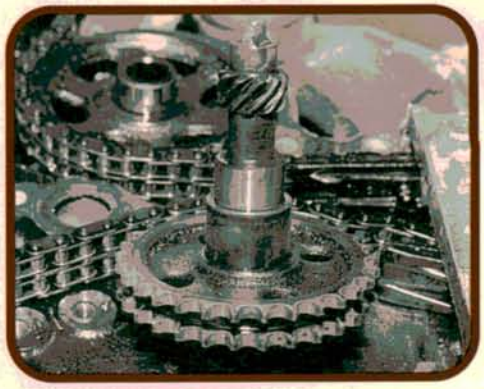
Remove the remaining cover-to-block bolts and the cover. Resist the temptation to pry between the cover and block or you'll scar the mating surfaces. Be careful not to damage the front sections of the head gasket which seal between the bottom front of the cylinder heads, and the top of the cover.

12

Replace the o-rings inside the cover. These o-rings seal the coolant passages delivering coolant from the water pump to the block. Clean the mating surfaces of the cover and block. Later, we'll seal the cover to the block using a thin bead of sealer such as Ultra Blue.

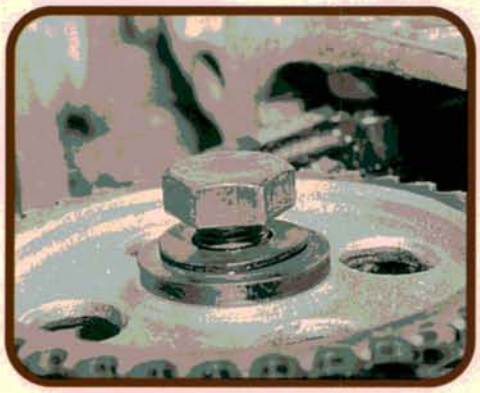
13

With the cover removed, it's smooth sailing. Remove the lower chain rails, and the tensioner rail. The right side crank rail is bolted in place. The left side rail slides onto pins. The tensioner rail is held in place by a pin which can be removed using our slide hammer puller.



14

Now remove the old cam sprockets. Drop the old chain through the channel in the heads, and remove it. Remove the distributor drive, crank and intermediate spockets, and replace them with new double toothed sprockets. The distributor drive is also a double sprocket. Angle it slightly to install it.

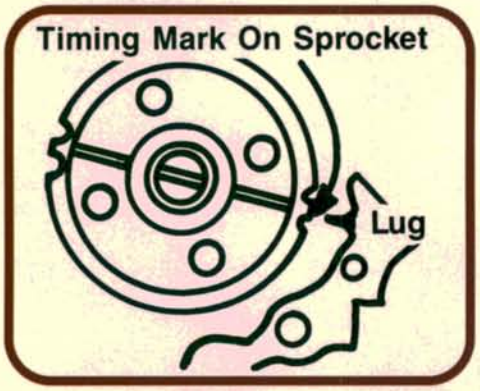


15

Cam sprocket retainer bolts are stretch bolts, and should be replaced with new ones. It is possible to install the cam and crank drive sprockets facing the wrong way, so pay careful attention to how the old ones came out. Don't install the chain rails until the chain is installed.

16

For now, drape the chain over the snouts of the camshafts. When setting the distributor drive gear, make sure to set it in place so distributor timing will be correct. Place ALL chain tension on the tensioner side of the chain, or the distributor will rotate later when the chain is pulled tight.



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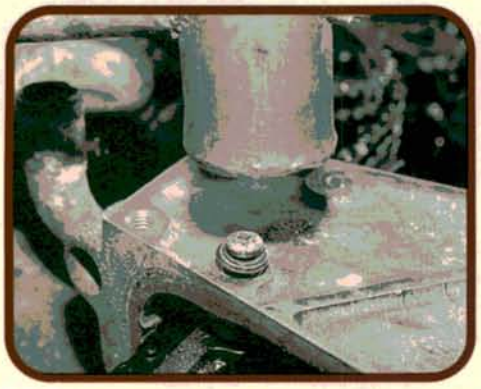
This illustration gives a better idea how the distributor drive should be installed with the engine set at TDC on Number 1. The sprocket timing mark should point to this lug on the engine as shown. Later, we'll reinstall the distributor with the rotor pointed as it was when we removed it.

18

Now we're ready to install the camshaft sprockets. New woodruff keys are a small, but wise investment here. Install the left cam gear first. This puts all the slack on the right (tensioner) side. Engage the teeth on the chain, and drive the gear onto the cam with a soft mallet. Double check timing marks.



19

Always install new chain rails. I've seen old ones cracked and broken, and the old rails will have a groove worn by the old chain, narrower than the width of the new chain. Thread a 6.00 x 1.00 bolt into the press fit pins to protect the threads, and tap the pins in place until they bottom.

20

Clean the mating surfaces of the timing cover and block, and apply a thin bead of low volatility silicone sealer. Don't forget to replace the o-rings mentioned earlier. Set up the oil pump chain as before, and reverse the procedures shown to this point to complete the job.