



Drill and Tap

Mercedes-Benz has long been known for their aluminum V8 engines. The 3.8 L (116.96), 5.0 L (117.96) and other aluminum Benz engines are surprisingly durable, especially when compared to the older 4.5 liter cast iron engines.

The aluminum engines are not sleeved engines, but a solid aluminum block. The secret to their longevity lies in the silicon-alloy used in building the block. It is very uncommon to find excessive wear on well-maintained engines, even after many miles.

But the use of aluminum does present a special set of problems for the repair technician. The use of stretch cylinder head bolts combined with the natural tendency for aluminum threads to weaken under pressure, can lead to problems over time. Leaking head gaskets are often a clue that repair of these threads will be necessary. That means installing thread inserts when threads in the bolt holes weaken, rather than replacing these very expensive engines.

When you find a stripped or damaged thread in a cylinder head bolt hole during a repair, installing

inserts in all the holes is the only way to avoid comebacks.

In or Out?

Okay. How do we do this job. Do we pull the heads in the car? Or do we pull the entire engine? Pulling the heads sounds easier. It is on most cars. But what would a Mercedes-Benz technician do?

All the Benz techs I know remove the engine. Working on the engine in the car can be a hassle. On SL models, for instance, access to the head bolts and to the holes in the block will be limited.

But there is an even better reason to remove the engine and work on it far from the car—the paintwork. When you drill and tap the block to install inserts, you make a pile of metal shavings. One veteran Mercedes technician said, “There are shavings and metal chips within a 20 foot radius of the engine by the time you’re through.” Even covering the car and blowing away the chips with compressed air may not remove all the chips, and the paint finishes on the Mercedes are not cheap.

Engine Removal Tips

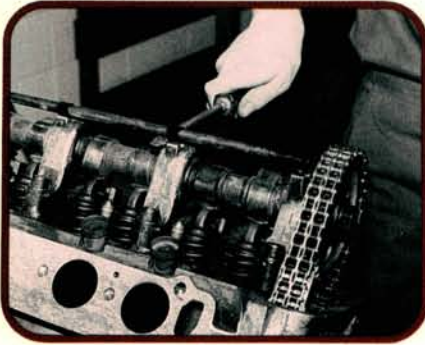
Here are a few tips that will speed removal of the engine:

- Don't remove the motor mount towers from the engine block. Instead remove the single long bolts which pass through the mounts.
- Make sure you support the transmission. The transmission cooler lines are attached to the engine at the oil pan. Remove these pan bolts.
- Do not remove the cams or cam towers from the heads.
- On SL models, remove the hood.
- Mercedes suggests that you don't need to remove the intake manifold, but that you should remove the exhaust manifolds. Do yourself a favor and do just the opposite. Remove the intake manifold. Then drop the front exhaust pipe but leave the exhaust manifolds

attached to the heads. It won't take long, and you'll thank yourself later.

- The transmission dip stick tube must be removed from the transmission to remove the engine since it passes through a hole between the right manifold and the head.
- The alternator and power steering will have to be unbolted and laid to the side. The steering pump lines can remain attached, however.
- You'll also need to disconnect the engine wiring harness, all linkages, and the transmission cooler lines. Remove the transmission and converter bolts, and the radiator.
- It's also a good idea to steam clean the engine before you remove it. It's a convenience to technician and customer alike.

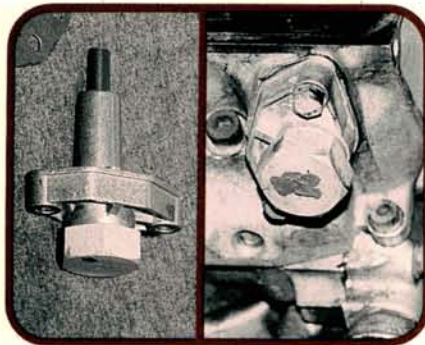
—By Paul Airoidi



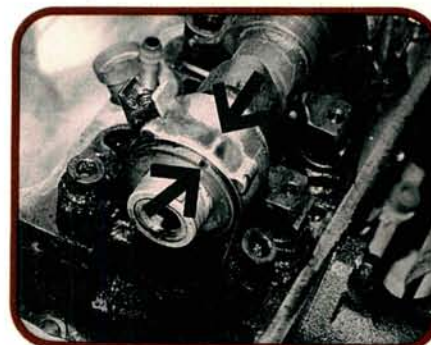
With the engine mounted on a stand, set the engine to TDC on number 1, and remove the valve covers. Make sure you have a good set of metric hex sockets in both short and long versions. Cam lubrication tubes can be removed by prying under the plastic inserts with a suitable tool.



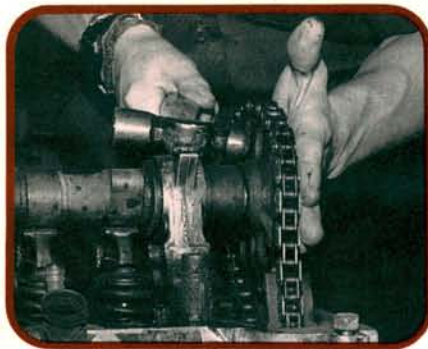
Replace all of the plastic inserts on the cam lubrication tubes (P/N 116 180 0184). Place the tubes in a vise to hold them. Use a small punch and hammer to tap the inserts one at a time along the length of the tube until each one pops off the end. New inserts can be installed by hand.



Remove the timing chain tensioner from the side of the right cylinder head. The tensioner butts against a chain rail which stays with the front cover. (Nothing will fall apart down inside the cover so don't worry.) Remove the intake manifold, cover it with a shop towel, and lay it aside.

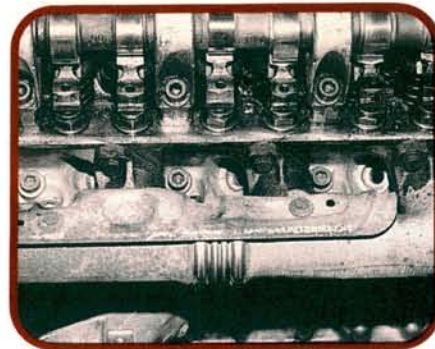


Again, Mercedes says the intake manifold can stay. But trying to fit the heads to the intake and block at the same time can be darned near impossible. Camshaft and sprocket marks must be lined up properly or valve timing will be off, and we could bend valves. There are factory marks to indicate correct timing.



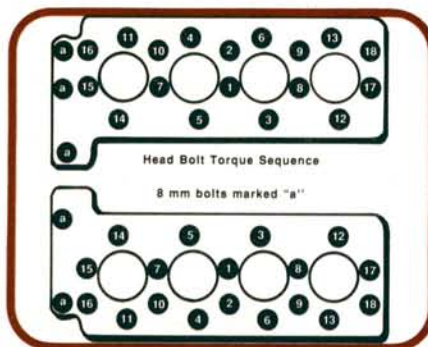
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Remove the sprocket bolts (one on each cam) and the sprockets. Let the chain drop into the front cover. This may send a chill down the spines of old Datsun techs, but don't worry, there are no other tensioners to pop out. You can fish out the chain later with a hooked tool or piece of wire.



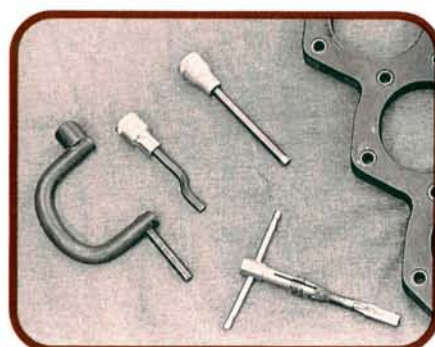
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Even though Mercedes suggests removing the exhaust manifolds, leave them bolted to the heads, whether you do the repair in the car or out of the car. Once you see the clearance you DON'T have to get at the exhaust manifold attaching bolts, you'll gladly leave them alone.



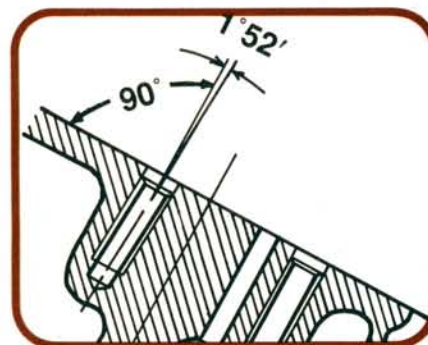
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Remove the head bolts in the reverse order from the normal head bolt tightening sequence. There are five smaller (8 mm) bolts at the front of the heads, two in one head, three in the other. There is one bolt in each chain well that is "hidden" so don't forget them. The other three are exposed and easy to see.



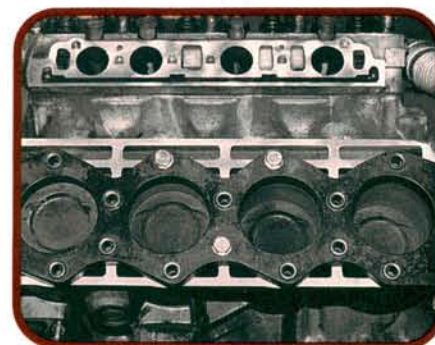
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Here are the tools needed for the threaded insert repair procedure. These include three variations of head bolt removal sockets used to remove the head bolts. Also shown is the jig needed to drill the holes in the block. Make sure you have extra drill bits and taps. Bits and taps should be sharp.



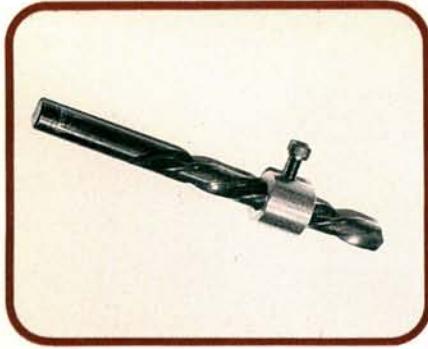
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Why the jig? Accuracy is one reason. And even if you think you have a steady hand, it's not steady enough to drill hole numbers 15, 7, 1, 8, and 17 diagonally into the block surface. That's right, these holes are drilled at 1 degree and 52 minutes from perpendicular. The jig is P/N 117 589 02 23 00.



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Using three 10 mm x 1.5 x 35 mm bolts, attach the jig to the block with its flat side down. We'll remove these bolts later and install thread inserts in them as well. Seal the cylinder bores with masking tape. Plastic covers are available from Benz, but tape is faster and easier. Don't use rags, they don't seal well enough.



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Drill the holes with a properly sharpened 10 mm high speed drill (I prefer cobalt bits) to a depth of 37 mm. Adjustable depth collars are available and are more accurate than tape or a dab of paint to mark drilling depth. Don't forget to add the thickness of the jig when setting drill depth.



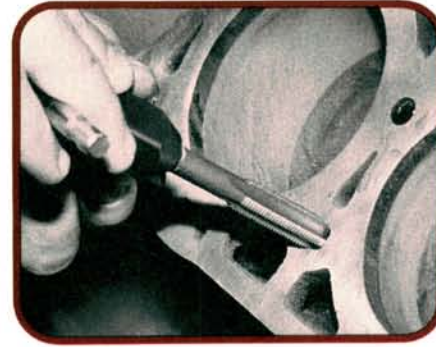
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When we said a "properly sharpened" bit we meant it. Improperly sharpened bits will cut oversized holes. Badly worn bits may cut undersized holes. The final drilled diameter should be at least 10 mm but no larger than 10.3. Holes that are either too small or too large will give us weak threads.



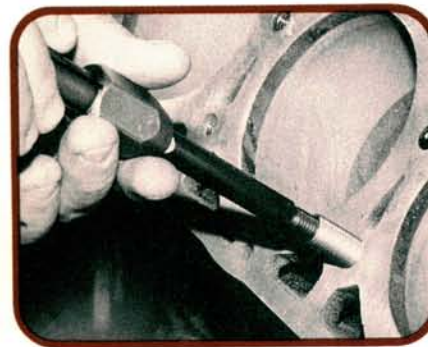
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Pre-cut each thread with a pilot tap. Lube the tap with honing oil. Use a T-handle and tap by hand. Back off the tap a quarter turn or so if you feel the tap begin to bind as chips build up. When you're done, blow out the chips with compressed air. Wear approved safety goggles!



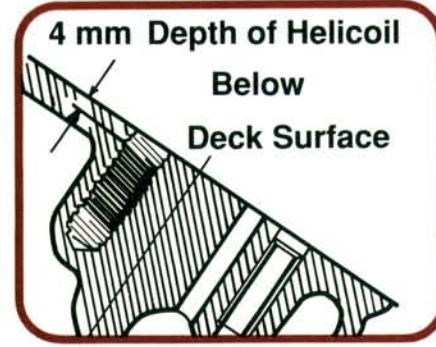
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Now finish-cut the threads with the Helicoil tap to a depth of 35 mm. Once again, make sure the tap is properly lubed, and blow out ALL the chips. Rethreading kits are available from Benz in kit form P/N 900 589 00 99 00. Generic drills and taps of the correct size will work, however.



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The threaded inserts used are different from those found in a regular Helicoil kit. They are $2\frac{1}{2}$ times longer than the diameter of the head bolts (equal to 14 threads). Install the inserts with the Helicoil installation tool. A small dab of Loctite is recommended. The coil pilot link can stay on the insert.



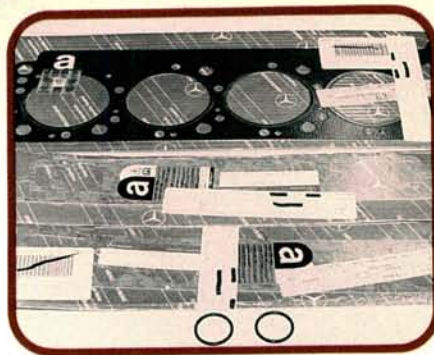
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Don't panic here. The upper thread of the coil insert will sit 4 mm below the deck surface. It's supposed to sit lower so it doesn't interfere with the head gasket. Do your self a favor here and screw a new, lightly oiled head bolt into each insert to ensure a smooth, snag free fit.



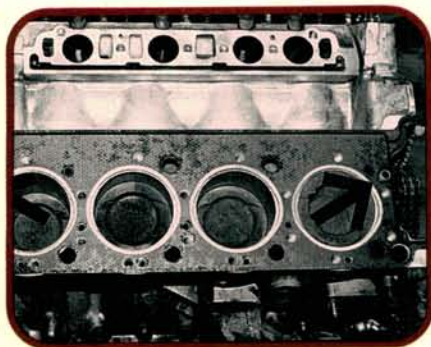
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Install only new head bolts. The bolts for 3.8 and 5.0 L engines are the same, but there are three separate part numbers for three separate bolt lengths. We replace the bolts since they are stretch bolts, and the old ones are already stretched. New bolts ensure a proper, lasting torque.



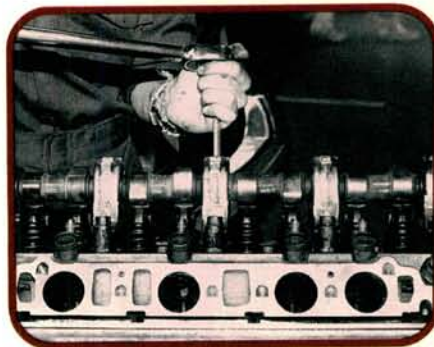
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The new head and manifold gaskets do not require any additional coating. Check mating surfaces for cracks, divots, and straightness. The top-end gasket kits for 3.8 and 5.0 L engines are different. 3.8 L P/N LT 116 010 00 80 and RT 116 010 01 80. 5.0 L P/N 117 010 15 80 and RT 117 010 16 80.



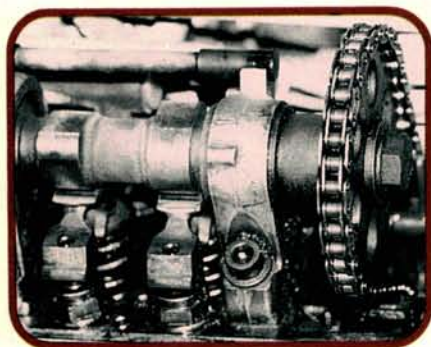
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Two pilot pins at each side of the block will hold the head gaskets and heads in place while you insert the new head bolts. The longest head bolts (M10 x 165) go in the cam towers at the exhaust side. Lightly oil the threads and the rim of all bolt heads before installing them.



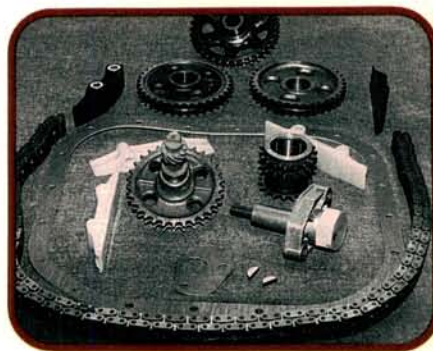
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Head bolt tightening is done in three steps. Initial torque is 30 Nm. Then follow with an intermediate torque of 60 Nm. Then take a 10 minute coffee break and allow the gasket to settle before final tightening. Then retorque all head bolts to 60 Nm one more time.



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Fish out the timing chain and reinstall the cam sprockets. Check the timing marks at the cam and also at the front damper for proper alignment. Also check the distributor for proper position. That's why we started by setting the engine at number 1 TDC. If we haven't moved anything, the marks should be right on.



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Reinstall the intake, then reverse your removal procedures to reinstall the engine. If you are working on a 3.8 L engine, you should definitely modify the existing single row timing chain and gears and install a double row chain and gears. Look for a follow up article on this repair procedure.