Daimler-Benz Multilink Suspension

It's a tangled nest of link-rods and bushings, but there's method to the apparent mess.

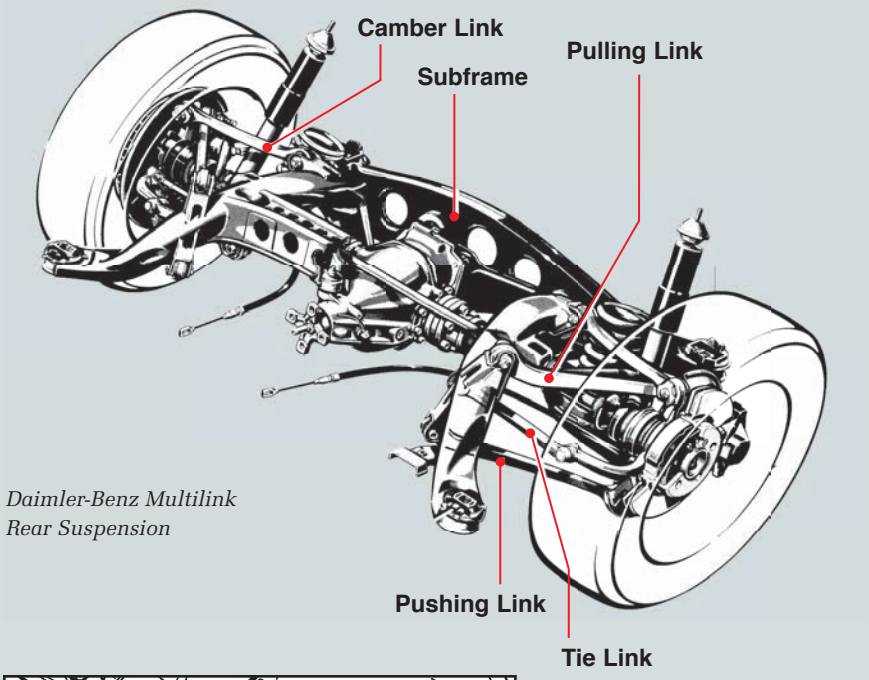
A big advantage to being the first to solve a complicated problem is that you get to patent the simplest solution, so anyone who wants to achieve the same effect has to do it in a more complicated and less elegant way. For independent rear suspensions, the engineers at Daimler-Benz AG hold that enviable position. The front suspension, too, is unique – not an SLA nor a Mac Strut but their own design entirely. The rear geometry is similar to what Porsche uses, so we may suppose some kind of cross-Stuttgart cooperation comes into play.

There are, by the usual count, five separate links controlling the position of the rear wheels, though purists might argue that the swaybar and the halfshaft count as independent links, too. We'll leave suspension fanatics to duke that question out. Let's see what the parts do and why.

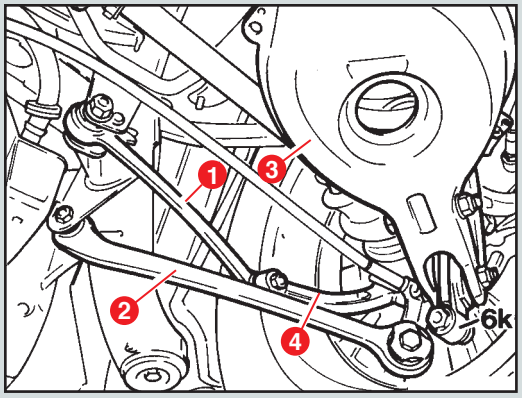
The spring link is the lowest and largest, with a cavity to hold the base of the coil spring and a lower dust cover to fend off road grit. It pivots inboard from the same solid frame member that holds the differential, and it holds the lower knuckle outboard through a yoke. Like all the other parts of this suspension, the most important inspection is to see whether there is any damage to the link. Since each link has a mirror-image link on the other side, damage assessment shouldn't be too difficult even though the links are all relatively intricate compound-curvature pieces. The dust shield is plastic and will ordinarily show damage much more readily than the link itself, though someone might have replaced one that was cracked without noticing link damage.

The spring link, like all links on this suspension, hinges on bushings, so the accuracy of the alignment angles consequently hinges on the condition of the same bushings. That also means that the alignment can gradually wander from its optimum settings by progressive wear of bushings. This does not have to be particularly noticeable at any one of them. If enough bushings start to wear in their load direction, the suspension will get out of line, just as it will when, after years and miles, the springs start to sag.

Often on a suspension with this many bushings, if several are worn, it is a good idea to replace the entire set. The exception is when oil or accident has damaged a single bushing. The problem with replacement of only one or two bushings is that, while they may be the ones most out of center, all the others have the same kind of wear to a lesser extent.



Daimler-Benz Multilink Rear Suspension



1. *Tie Link*
2. *Pushing Link*
3. *Spring Link*
4. *Knuckle Arm*

Most notable from below are the spring link and the pushing link, though you can also see the halfshaft, the tie link and just the lower tip of the swaybar link right below the spring link. The emergency brake cable – not a suspension link, of course – also is visible from this angle.

The next link we'll consider is the camber link, extending from the frame section above the axle to the top of the axle knuckle. The function of this link, in combination with the spring link, is to hold the camber of the wheel as close as possible to constant with respect to the pavement, regardless of the load on the vehicle and regardless of the lean the vehicle may take in a turn. As a guiding link only, with no weight load beyond what is required to hold the wheel in proper vertical position, there is usually only minimal wear on the camber link bushings. And in the upper position it holds above the axle and most of the suspension elements, it is quite unlikely that any road hazard will strike it without doing even more conspicuous damage to the other suspension links on the same side.

The tie link connects an arm on the knuckle to the frame, and is adjustable with an eccentric bushing to make corrections to rear toe and thrust line. Keep in mind that on this vehicle the geometry is so designed that in a steep turn, such as one might encounter on a high speed curve, the tie link will toe the outside wheel slightly inward, to correct for the tiretread squirm that would otherwise make the rear end seem to pivot slightly outward.

The two remaining links are the 'pushing link' and the 'pulling link.' What do they push and pull? Depending on your point of view and on whether the car is accelerating or decelerating, either the car itself or the axle. The drive forces developed by the engine and delivered by the drivetrain to the road are conveyed to the body of the car during acceleration and normal cruise through the pushing link. The pulling link serves to keep the axle from twisting away from the drive torque.

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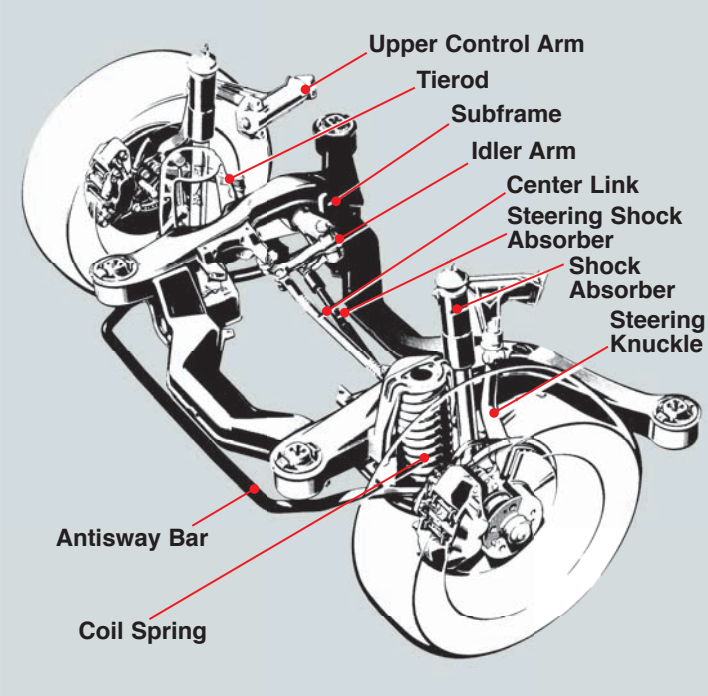
A closer view shows the yoke of the spring link, with the swaybar link coming down between the forked part; the push link with its connection to the knuckle and bushing; the tie link with its curved arm from the knuckle and the link extending to the frame, with a geometry to make subtle changes to toe under vehicle lean; and the emergency brake cable.

Things are very clean and spare behind the suspension because there's no reason to have links extending that way. You can see the spring and camber links and the outboard-placed shock absorber clearly. The wires to the brake pads are wear-sensor leads, of course.



On the front suspension, you can see that the control arms are of very different size and pivot on nonparallel axes. The tierod connects to a traditional parallelogram steering system, not a rack and pinion. And the inboard spring with outboard shock complete the suspension.

These links, being forward, and the pushing link being low and in front, are more subject to damage by debris and impacts. While they are solid components, it is possible to dent or bend them, and inspection is easy enough by comparing the suspect link to the one on the other side.

When you do replace bushings, of course, get them finger tight first, then lower the car so its weight is on its wheels before torquing them to specification. If you tighten them with the suspension hanging below the frame, the bushings will bind in the fully extended position and will be subject to considerably more stress in use, leading to a much-shortened useful life.

The antisway bar connects from its links at the bottom of each knuckle to the bar itself in the subframe. While the antisway bar is relatively inaccessible compared to the other links, its function is familiar to anyone who works on high-end alignments. It's rare to have to do more than replace swaybar links or bushings.

Up in front, the DB suspension couldn't be more different. Yes, of course, its multilink and complicated; that goes without saying. But the geometry is quite different. Stout lower control arms work against a very strong spring very far inboard – effectively reducing unsprung weight. The gas-pressurized shock absorbers are as far outboard as will clear the wheels, providing optimal dampening. The upper knuckle pivots on a ball joint at a much smaller control arm, pivoted at an entirely different angle from the lower. Ball joints, tierods and swaybar, links and bushings are all conventional.

There are not a large variety of aftermarket parts for this suspension, but some are available. We haven't provided specifications or adjustment techniques because while the basic geometry of the suspension is common to almost all the current Benz vehicles, there is enough variation from one to another to make checking the manual an important step for either parts replacement or alignment. ■

—By Joe Woods