

Suspension Travel

By Steve Dinan

Many newer BMWs provide very little suspension travel from the factory. In addition, many of the newer cars employ shorter progressive bump stops as compared to previous designs. A progressive bump stop is designed to absorb and dissipate energy when a wheel hits a large bump and a significant amount of the available wheel travel is used. As the bump stop is progressive, the initial contact is not felt by the driver. However, the bump stop is designed to gradually stiffen so that a large amount of energy can be absorbed without upsetting the car when it is on the limit of adhesion. If you go back many years, bump stops were simply crash barriers that prevented damage to the suspension system when all of the available travel was used up. Like so many automotive components, today's bump stops feature more high-tech designs and are now a progressive spring of sorts that are actually part of the total spring rate. When properly designed, the current designs allow the cars to handle enormous bumps while maintaining adequate control.

When lowering your car, it is important to properly "tune" the bump stops in order to maintain the appropriate amount of suspension travel. Clearly they must be made shorter as the lower ride height will reduce available travel. Many suspension companies will instruct you to simply cut the bump stops in order to shorten them. I highly recommend against this approach! As they are progressive, if you cut the soft end off of the bump stop you will most certainly feel the contact more because it is no longer as soft as it should be. If you cut off the stiff end, it will not be able to absorb enough energy over bigger bumps and the car will be too stiff, causing the car to bounce when the bump stop is fully compressed.



As I mentioned before, BMWs are now designed with less suspension travel and shorter bump stops than ever before! This makes it more challenging to lower the cars without severely compromising handling capabilities, let alone ride quality.

The new M3 and M6 are two examples of this situation. In stock form, the M3 has just 0.5 in. of suspension travel in the front before the progressive bump stop is contacted. In stock form the M6 has just 0.5 in. of travel front and rear. Both cars are equipped with very short bump stops from BMW, making it difficult to make them any shorter and still be effective in terms of absorbing adequate amounts of energy. These models represent the most extreme examples of this issue we have encountered to date!

A significant part of any Dinan suspension design is to thoroughly analyze suspension travel and bump stop requirements. The shortest bump stop that we could employ needed to be 2.125 in. long in order to absorb an adequate amount of energy, making it only 0.25 in. shorter than stock! Since 0.5 in. of travel is the acceptable minimum to avoid premature bump stop contact, we had to actually increase travel if we wanted to lower the cars at all. In addition, all of the M6 models and most of the M3s are equipped with EDC (electronic damping control). The damping characteristics of the stock EDC shocks are very good, so our objectives included making the lowered cars function with the factory electronic shocks.

In addition, the M3s not equipped with EDC also feature a great stock shock. They are lightweight and offer excellent damping characteristics, necessitating the same considerations as with the M6 and EDC equipped M3s.

The Dinan solution was to increase travel in the spring perch area, without requiring replacement of either type of stock shock. This was accomplished in the front of the M3 and M6 by modifying the stock upper guide support (Or spring perch) and fabricating completely new upper spring perches in the rear of the M6!

For the M3, we were able to shorten the front guide support by 0.3 in. so that when combined with the shorter bump stops a total of 0.55 in. of travel is achieved. This enabled us to lower the M3 by 0.5 in. while retaining the appropriate amount of travel for improved handling and civilized ride quality.

For the M6, the spring perches were shortened by 0.5 in. in the front and 0.85 in. in the rear, so when combined with a shorter bump stop travel is increased to 0.75 in. up front and 1.1 in. in the rear. This enabled us to lower the car by 0.75 in. front and rear while retaining the appropriate amount of suspension travel. Everyone, including Dinan, would like to lower the M3 and M6 even more, but we will not compromise the performance and ride quality purely for the sake of aesthetics.

The custom spring perches and bump stops certainly add some cost to the spring set/suspension system but are well worth the investment when you consider the dramatic

improvements in handling and maintaining civilized ride quality. Recent features appearing in *Modified Luxury and Exotics*, *Bimmer* and many more to come will attest to the benefits of a properly tuned suspension system.

Feel free to contact a Dinan performance specialist with any questions you may have at 800-341-5480.

Performance without sacrifice