DAMPERING

REMOVING THE BOBBLE HEAD SYNDROME

This may shock you, but without the dampering you will be like a bobble head going down the road.

Shocks and struts are the devices that work with your springs to control your Mustang through the corners, and over the potholes down the road. The term dampering explains the key to the mission of a shock or strut. For this discussion we can say a shock and strut are virtually the same. For those who need a little understanding of the difference between a shock and a strut, first you must understand the basic internals are similar. The main difference is that a shock only acts as a damper and is usually mounted between the lower control arm and the body. A strut not only acts as a shock, but also becomes part of the suspension system. It replaces the upper control arm, upper ball joint, and shock. In most cases the front springs may also be incorporated, making it one complete unit.

The basic description of the function of a shock and strut is that it converts the suspension's kinetic energy into heat by forcing fluid through a series of valves within the shock body. Additionally, they provide control of unwanted suspension motions allowing the tires' contact patches to better stay in contact with the road surface. Finally, they can have a major affect on the vehicle ride quality and handling balance anytime the vehicle suspension is moving through its range of motion.

During a typical mile of travel down the road, the damper will move in (compression) and out (rebound) millions of times. Break that mile into one second of travel, and the number of times the damper moves (stroke) defines the operating frequency (Hertz, Hz). Controlling body roll entering a corner induces relatively few strokes of the damper (low frequency), while traveling over broken pavement at highway speed results in a much higher quantity (high frequency) of short strokes. Knowing this, damper frequency can also be used to tune handling and ride quality. Vehicle body roll control needed to aid handling occurs at a frequency of around 1Hz. Ride impact harshness is felt when damper frequency reaches approximately 10Hz.

Hit a bump without dampers, and the suspension would continue to bounce up and down uncontrollably like a bobble head doll. The damper's job is to reduce the size and/or speed of the suspension movement, preventing the never-ending bobble head scenario. We've all seen that older car going down a smooth highway with one of the rear tires visibly vibrating up and down rapidly. That motion is caused by a worn-out damper that is no longer controlling the movement of the suspension. The lack of damper control allows the suspension to move uncontrolled.

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The piston moving back and forth through the oil inside the damper creates the resistance needed to control (dampen) the suspension movement. How much resistance (force) develops for a given movement is determined by internal valves that control the flow of oil. Based on the force, the valves open or close to self adjust to each bump or any vehicle body roll. All dampers do this; but some higher-end shock units add a second valve system that responds to the damper's operating frequency, allowing ride and handling to be tuned more independently than with conventional dampers.

High performance design theory for tuning dampers uses the compression (in) force to dictate the amount of axle movement and is directly linked to handling like steering response, road holding, etc. The rebound (out) force is used to control body movements (side-to-side body roll and/or pitch fore and aft) and is also directly linked to ride comfort.

Traditional user-adjustable shocks for most applications have a fixed setting for the compression rate, while allowing the user to manually adjust the amount of rebound control to tune the balance between ride comfort and handling. Many dampers also have a fixed compression setting, but instead of allowing the user to manually adjust the rebound, the internals of some dampers automatically adjust the rate and shape of the force curve (when plotted on a graph) on the fly. What this means is that the response to the frequency of the damper's movement is immediate.

I hope this helps a little to understand the dynamics of the shock/strut. Remember: Proper, good operating shocks make your Mustang handle better, help your tires last longer, help your car stop better, makes your butt feel better at the end of your journey, and removes the bobble-head syndrome.

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