

HYDRAULIC BUSHES

PRECISE steering, responsive handling and minimal transmission of road noise are highly desirable attributes for any street car. Problem is, optimising steering feel and responsiveness is achieved by firming everything up, while reducing road noise requires softening the suspension-to-chassis joints.

Automotive engineers thus face the seemingly impossible task of designing suspension that's hard and soft at the same time! One device employed to achieve these two opposing requirements is the hydraulic bush.

Due to their complexity, manufacturing costs for hydraulic bushes are high, so they're generally only used where they'll be of most help.

The front suspension in an AU-BF Falcon runs a hydraulic bush in the forward pivot of the lower A-arm; there's also one in the front-radius rod bush of VT-VZ Commodores (see circled areas opposite).

These are highly stressed applications, as the bush's main job in either set-up is to locate the wheel in the correct fore and aft position, absorbing all braking forces. In short, they cop a lot of punishment and must withstand the tremendous forces generated by hitting potholes, running up driveways, and clipping kerbs or roundabouts.

HOW THEY WORK

WHILE designs differ slightly, all hydraulic bushes rely on the same principle and comprise an inner and an outer sleeve separated by a void filled with hydraulic damping fluid. The bush is firm longitudinally due to the incompressibility of liquids, yet the vibration-absorbing properties of the fluid dramatically reduce steering-wheel shake and transmitted road noise.

EARLY RETIREMENT

NEW, these hydraulic bushes are highly effective, but in Falcons and Commodores have consistently given relatively short service lives. This is because the fluid escapes, increasing the bush's compliance, in essence making it softer and allowing excessive deflection. Steve Broad from Nolathane has come across cars with fewer than 20,000km on the clock exhibiting signs of hydraulic bush degradation.

TELLTALES & TESTS

VT-VZ Commodore front wheels with shot bushes will experience as much as 40mm of rearward deflection under heavy braking. Don't look for tell-tale signs of fluid leakage — there won't be any, as it's glycol-based and washes away without a trace.

A roll-by test provides for the best assessment. Simply roll the car along at up to 5km/h and jump hard on the brakes. As the brakes are released, you'll see the front wheel jump forward. If this forward movement is in excess of 10mm, chances are the front bushes need replacing.


A spongy brake pedal is another symptom, as a shot bush allows excessive front-wheel toe-out during braking, which makes the car squirm about.

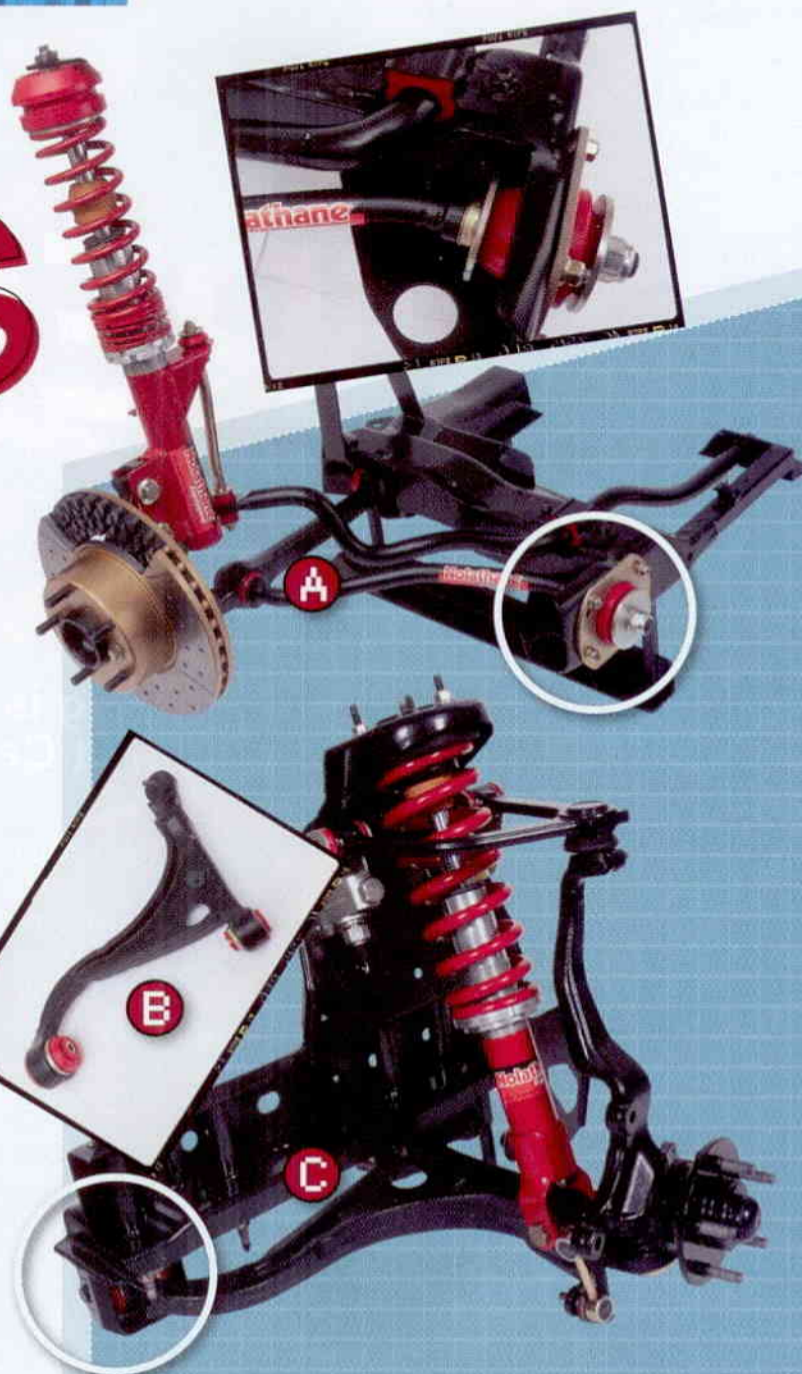
Chronic brake shudder and pedal pulsation from rotor-thickness variation are known causes of accelerated bush deterioration — the rapid pulsations simply pump the fluid out of the bush. Shot bushes are often overlooked when rectifying brake problems, yet bushes are an integral part of the braking package and replacing worn ones can make your car feel like it's undergone a brake upgrade.

FACTORY VS AFTERMARKET

REPLACING shot bushes will eliminate tram-lining and front-end shimmy, improve ride comfort and steering response, as well as providing significantly more feel and feedback through the steering wheel. But do you replace them with factory originals, or aftermarket urethane types? Dropping in a new, factory-style rubber bush should have your front end working exactly as it did when new — providing all the other bushes along with your shocks and ball joints are in good order.

Alternatively, there's the urethane option, something all the suspension companies have developed. The designs of the urethane versions create similar parameters to the fluid-filled rubber versions but without the potential for fluid leakage. Forget the rock-hard urethane bushes of the past; improved manufacturing and materials mean current urethane bushes achieve close to factory levels of ride comfort and transmitted road noise, but with improved longevity and performance. If you do want to step things up a bit, harder urethane can be specified.

As with dampers, bush degradation happens over such a long time that many drivers don't notice the drop in performance until they're renewed. This type of diagnosis and repair is bread-and-butter work for suspension specialists and mechanics; why not get them to check yours? 



A: This is the front-right corner of a VT-VZ Commodore. The hydraulic bush (insert and circled) lives in the front crossmember, under the radiator
B: Note the different diameters of the two bushes in this BA-BF Falcon lower control arm. The hydraulic bush is the larger of two, which is typical due to their internal structure
C: This is the passenger-side front of an BA-BF Falcon. The hydraulic bush is circled and lives right at the front of the car
D: Areas outlined represent the voids where the hydraulic fluid is contained in these sectioned Commodore and Falcon bushes

