

Shock Absorber length, is it Important?

Contrary to popular belief, length is important.

The purpose of a shock absorber is control spring and body movement throughout the entire suspension travel. For this reason the shock absorber must be able to work through the entire distance of the suspension travel.

If the extended length of the shock absorber is too short it will "top-out" and reduce the extended travel. "Topping out" is the term used when the piston inside the shock absorber collides with the cylinder head.

If this is allowed to happen continuously, damage will ensue to the mounts and possibly the internal rebound stop. Consider this, if "topping-out" was allowed to continue, then the extended travel of the suspension would be emulating the action of a slide hammer, trying to pull the shock absorber apart, possibly causing the following:

- Faulty operation of the piston
- Damage to the upper and lower shock mounts
- Damage to the cylinder head and the unit may leak oil

The other problem is that if the shock absorber that has been fitted to the vehicle is too long, in this case the vehicle suspension could experience the shock absorber "Bottoming out". This term is used when the shock absorber is fully compressed, but the suspension still has an allowed amount of travel to go. There are two possible scenarios, one, the top of the shaft will make contact with the top of the body, where the top seal is housed and damage will occur. When this happens oil will be allowed to escape. Extensive damage will also occur to the shock absorber mounts, to the point of possibly becoming separated from the body, as well as the possibility of damaging the fixed points on the body/chassis.

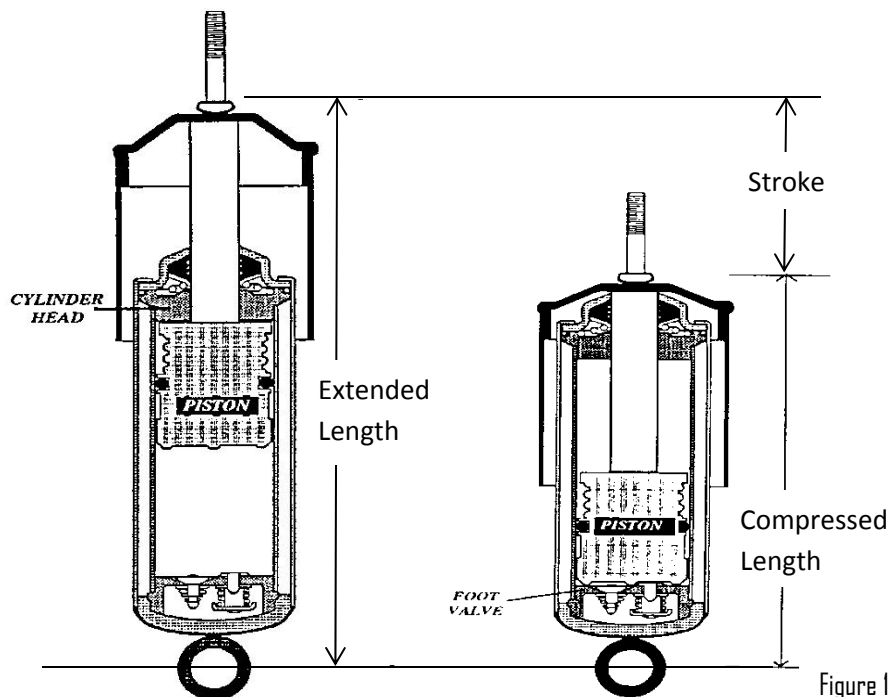


Figure 1

When the vehicle is designed, the suspension travel is an important factor when calculating the shock absorber's working length. While the vehicle remains at standard ride height and the correct part numbered shock absorber is fitted to the car, then there will be no issues.

But this is not always the case, as you will find that many vehicles have :

- Have had the suspension modified
- Had the vehicle raised (S.U.V. or 4 W.D.)
- Have been lowered excessively
- It also may be a private import (vehicle not available in Australia from the dealer)
- Or it may be a special use vehicle

So, if you are unsure of fitting a shock absorber to a vehicle, the three rules in suspension are "Measure, Measure, Measure".

When it comes to determining the correct length of a shock absorber to fit an application, you need to adhere to the following method: (refer to fig. 2)

- Measure the extended and compressed length of the shock absorber
- When measuring a "Pin/Pin" type of mount, measure at the base.
- When measuring a "Loop/Loop" measure to the middle of the loop.
- If the shock absorber has a "Pin/Loop", measure from the bottom of the pin to the middle of the loop.

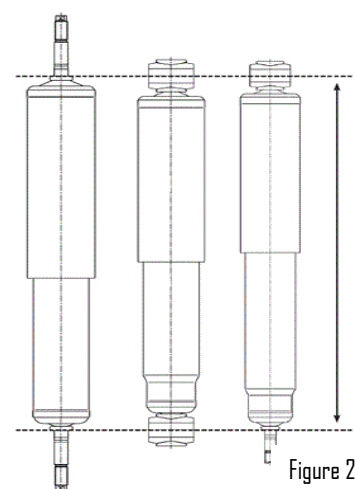


Figure 2

Compressed Length:

Measure the following distances as per figure 3. & figure 4.

- The shock absorber length when installed (I.L.), with the vehicle at normal ride height. (N.R.H.)
- The Bump Stop Clearance (B.S.C.) at normal ride height (N.R.H.)
- The Bump Stop Height (B.S.H.)

How calculate the answer, using the following example of the formula.

Installed length of the shock absorber is 435mm

The bump stop clearance is 100mm

The bump stop height is 95mm

Compressed Length = $(IL - BC - \frac{BHS}{1.5}) = (435 - 100 - \frac{95}{1.5}) = (335 - 63) = 272\text{mm compressed length}$

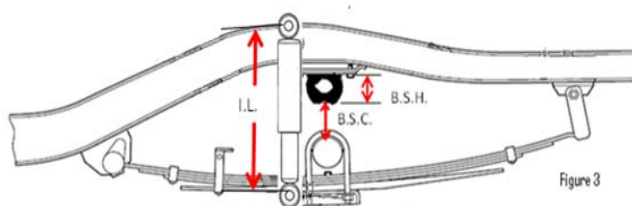


Figure 3

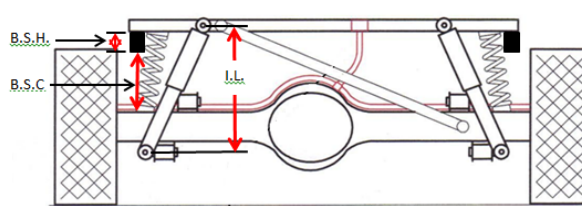


Figure 4

Extended Length:

When checking the shock absorber for the correct extended length, raise the car and place supports under the chassis, not the axle or control arms, as we want the suspension to “hang”.

Remove the lower mount of the shock absorber and slowly lower the suspension to full droop whilst maintaining some support under the axle or control arm. The reason for this, is not to stress the flexible brake hose at full droop. If there is an amount of travel to go and there is tension on the flexible brake hose, then it may be wise to investigate the fitment of a longer hose.

The extended length of the shock with a leaf spring suspension wants to be approximately +12mm. For a coil spring suspension the extended length is required to be approximately 12mm shorter. The reason for this, is to maintain a “trapped coil” at full suspension droop.

Other things that should be considered:

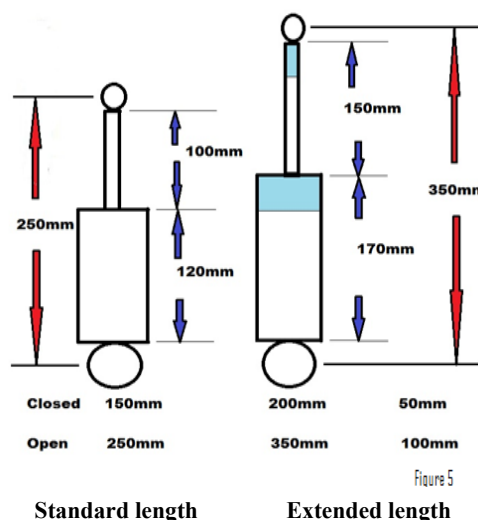
When a raised suspension kit has been fitted to a vehicle, there will normally be the requirement to fit “Long stroke Shock Absorbers”

For a shock absorber to gain extra length, we first increase the shaft length and then increase the body length.

As figure 5 shows, the over all extended length of the shock has been increased by 100mm, but the increase of the compressed length has only been increased by 50mm, because the 50mm of shaft length (the blue section) will fit into the body.

So there is no damage to the shock absorber under full compression, the bump stop has to be increased in length by 50mm.

This may be achieved in one of two ways, place a spacer of 50 mm between the bump stop and the chassis (using 50mm longer mounting bolts) or replacing the bump stop with a longer unit, with similar compression capabilities.



Bump Stops

All suspensions will have some form of bump and rebound stops, whether it be beam axle, live axle, independent, wishbone or McPherson strut. In a lot of modern cars, the bump stops may now act as a secondary load carrying device.

The purpose of these are to limit the travel and protect suspension components, especially the shock absorbers. Even if you don't see them they will be there somewhere in some shape or form. Checking the bump and rebound stops is an important part of checking the suspension's overall condition. If they have been found missing or deteriorated, a new bump stop is to be fitted, otherwise there will be NO warranty given to new shock absorbers when fitted.

NOTE: DO NOT MODIFY A BUMP STOP UNTIL YOU ARE FULLY AWARE OF HOW THIS WILL AFFECT THE SUSPENSION TRAVEL AND OTHER STEERING AND SUSPENSION COMPONENTS.

