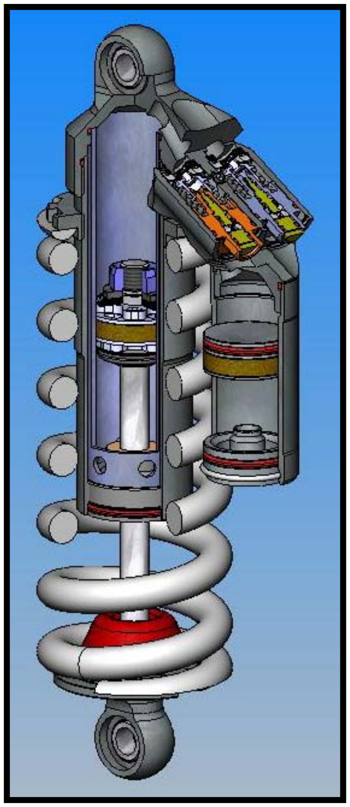
Cane Creek Double Barrel Instructions



Congratulations on your purchase of the Cane Creek Double Barrel rear shock. Developed in partnership with Öhlins Racing, the Double Barrel brings revolutionary suspension technology to the bicycle market. For nearly three decades, Öhlins Racing AB, based in Stockholm, Sweden, has produced high-performance suspension systems for the elite teams in all disciplines of World Class motor sport racing. Sharing the precision quality and exceptional performance that is inherent in Öhlins' designs, the Double Barrel is designed for performance in extreme off road conditions. The unique Twin Tube design incorporated in the DB-1 offers the broadest adjustment range available in suspension. The DB-1's adjustment features give you the control to tune the shock your way for your bike. Enjoy the ride.

> **Caution:** Reading and following the set-up instructions carefully and methodically is critical. Incorrect tuning can produce poor results or even dangerous riding performance. See pages 5 & 6 for key set-up instructions.

Design Background:

Most shock absorbers are the De Carbon type (figure 1). These shocks separate the gas from the oil with a dividing piston, usually located in a remote (or piggy back) reservoir. Primary damping takes place via the main piston by using a shim stack. The shim stack resists the flow of oil though the ports on the piston. Stiffer shims yield more resistance; and, thus, more damping force. Some oil is also displaced by the shaft entering the body chamber. This oil flows out to the reservoir where the expansion chamber can accommodate it. When the shock rebounds, this oil returns to the main chamber by the same route.

Variations of this style of shock will incorporate external adjusters to control the damping characteristics. The most common adjustment controls the rebound damping. A small needle valve running through the center of the piston shaft controls the flow of oil as the shock

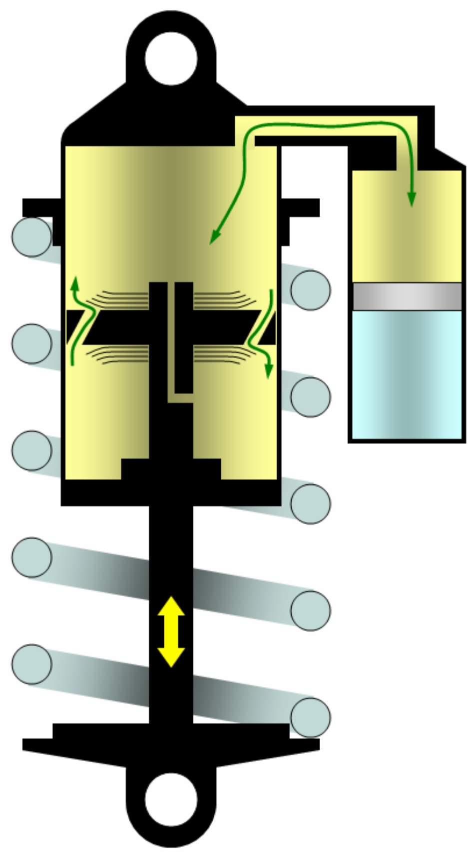


Figure 1: De Carbon type

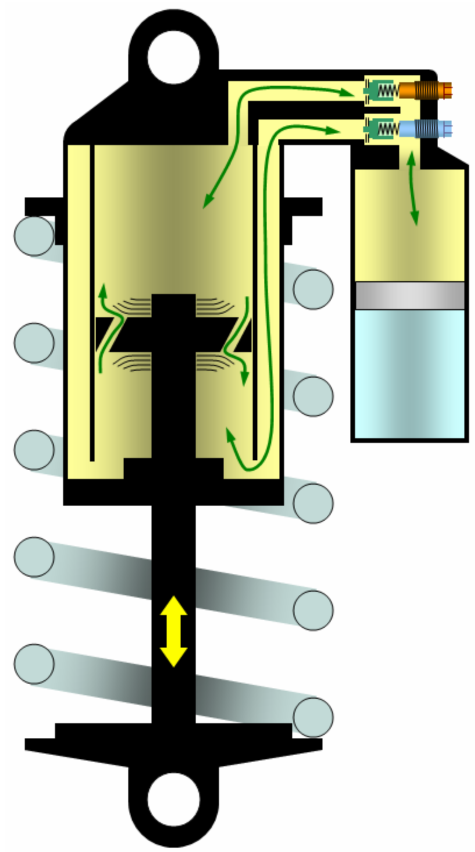


Figure 2: Twin Tube type

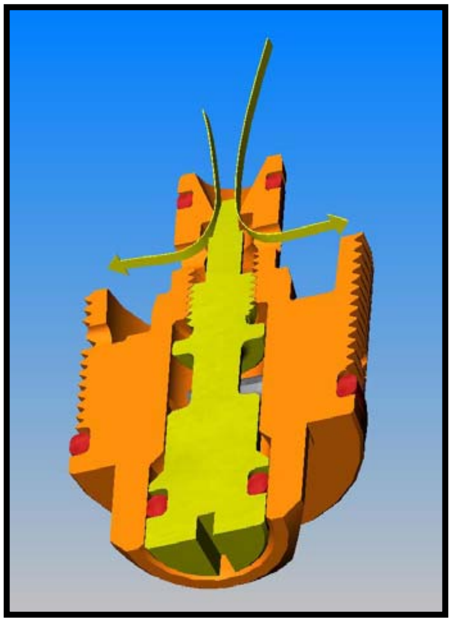


Figure 3: Low speed bleed valve.

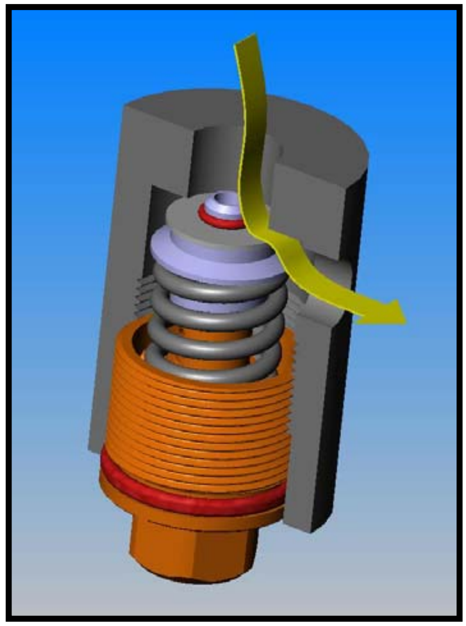


Figure 4: High speed poppet valve.

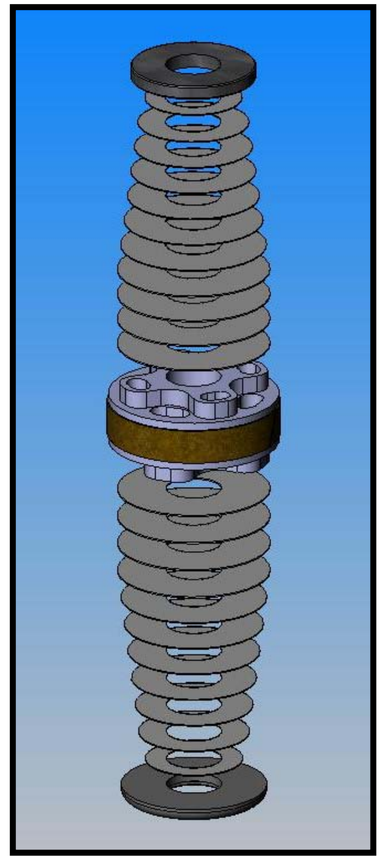


Figure 5: Main piston shim stack.

extends. In some designs adjusters are added to the reservoir passage as well.

The De Carbon style shocks function very well if adjusted properly. Unfortunately, the external adjusters are limited in their range. The rebound bleed valve works primarily on low speed damping. Thus, it has little effect on high speed movement. Also, external adjusters on the reservoir have little effect. The reason is that they dampen only a small percentage of the oil—only the oil displaced by the piston shaft. Some designs will try to increase the effect by using larger piston shafts, but this has a negative effect on the pressure balance and performance of the shock overall. So, to achieve the best characteristics, the shock must be disassembled and re-valved for each specific application—not an easy task.

Figure 6: Shock dynamometer

The Twin Tube technology (figure 2) incorporated in the Double Barrel shock is different. Rather than pumping only displaced oil back and forth to the reservoir, the oil circulates continuously through the valving to achieve highly controllable, independent damping.

There are three distinct damping features in the DB-1 for both the compression and rebound strokes. The low speed adjusters (figure 3) consist of needle style bleed valves that control the flow of oil when the shaft is moving slowly. Turning the slotted screw varies the size of the orifice through which the oil flows. A larger orifice allows more oil flow and, thus, more suspension movement slow speed travel. The high speed adjusters are poppet style valves (figure 4) that open once the pressure from the oil flow is significant enough. Turning the hex adjusters varies the spring preload behind the poppet and determines the opening force. Finally, the main piston in the shock has both a compression and rebound shim stack (figure 5). These control the high speed damping characteristics for general suspension control. Separating all these components are check valves that allow them to operate totally independently.

The value of the Double Barrel design is in the external adjustments enabled by the twin tube technology. Rather than disassembling the shock to change shim stacks, an equivalent range of control can be achieved by simply turning the adjusters. Changing the adjustment of one will not affect the performance of another. You have immediate feedback on the trail. All these features work together to create the perfect performance for your unique riding style and conditions.

Theory:

In order to better understand the function of the Double Barrel shock, it is helpful to have some background in the science behind dampers. Dampers are basically energy absorbers. They accomplish this by slowing the flow of oil though various types of valves. Because oil is nearly incompressible, it is a good fluid for precise damping control. The more the oil is constricted, the more the motion of the shock is slowed. The energy from the bump on the trail is transformed into heat in the oil through the damping process.

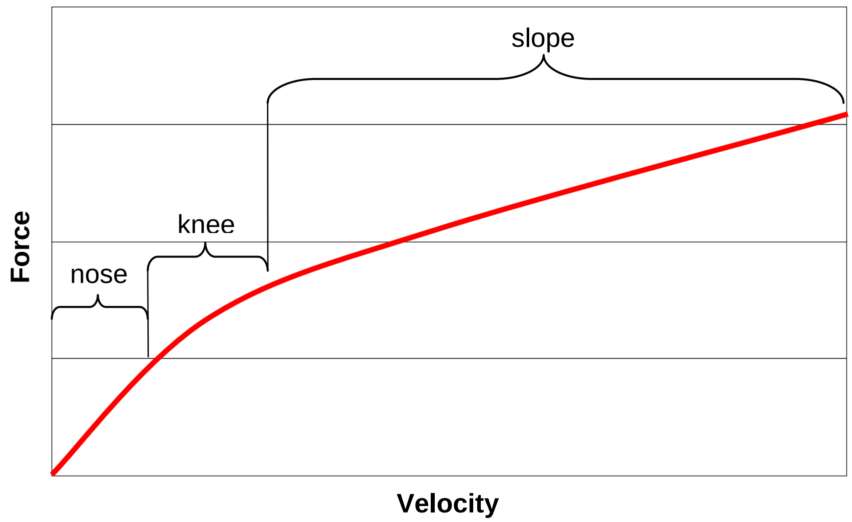


Figure 7: Damping curve from a dynamometer

When discussing damper dynamics the terms "low speed" and "high speed" are discussed. This does not refer to the velocity of the bike, but rather, the speed of movement of the shock's piston shaft into the body of the shock. Low speed inputs come from slow undulations on the trail or movement of the frame caused by pedaling forces. High speed inputs are a result of bigger impacts such as dropping off a ledge or hitting a bump rapidly.

In order to determine the characteristics of a particular shock the damper forces must be measured. A dynamometer is a test device used to study this performance. The damper is cycled though a compression and rebound stroke while measuring the force it produces. This information if graphed on a force vs. velocity plot. A typical dynamometer curve would show that as the velocity of the shaft increases the force also increases. The three regions of the typical damping curve are the nose, knee, and slope (figure 7). The nose is the low speed (slow shaft movement) region and the slope is the high speed region. The knee is the transition between the two. The adjustments made to the shock will affect the force output at the various shaft velocities.

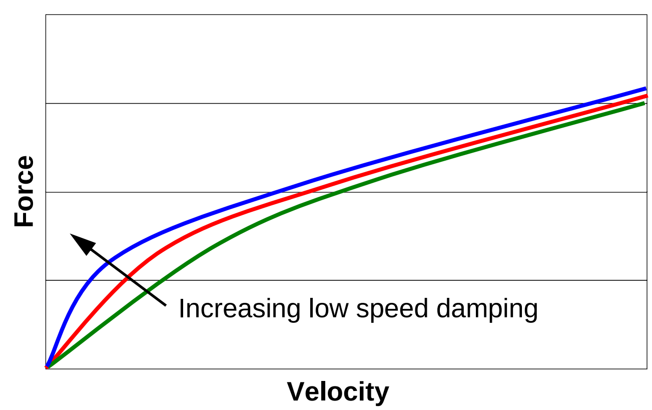


Figure 8: Effect of low speed damping adjustment.

The low speed adjustment will affect the force in the nose region of the graph as shown in figure 8. More low speed damping will increase the amount of force generated for a given velocity. On the trail, this means that the slow shaft movement generated by small inputs like pedaling forces will be controlled.

The high speed adjustment controls the damper force in the slope portion of the curve (figure 9). The slope of the curve increases with more damping input. Thus, more force is generated at a given shaft velocity. On the trail, this translates into the damper being able to absorb bigger hits without bottoming out.

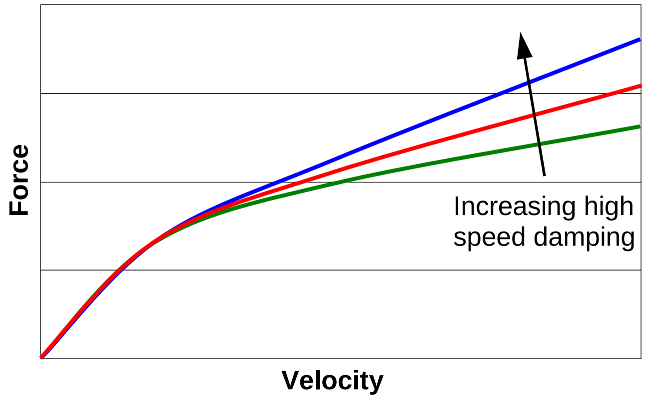


Figure 9: Effect of high speed damping adjustment.

Function:
The Double Barrel design enables the independent control of each portion of the damping curve for both compression and rebound strokes. The unique valving has a significant effect due to the fact it is continuously acting on the oil pumped through the circulating system.

For low speed shaft movement, the brass needle valves control the shock's response. The movement of the piston does not produce enough pressure to open the main shim stack or poppet valves. Therefore, the oil is directed through the precisely metered needle valve orifice (figure 10 & 11). This restricted flow damps the movement of the shaft minimizing the undesired suspension movement. The low speed damping adjustability for both the compression and rebound strokes allows the rider to fine tune the performance to the rider's style. If the shock movement comes primarily from powerful pedal strokes, then increasing the low speed compression damping will dial this out. If the movement seems linked more to the "dead" spots in the pedal stroke, then the low speed rebound adjustment can effectively reduce shock movement and suspension "bob". Be careful in using the rebound damping adjustment as too much damping may cause the shock to "pack up" and not be ready to respond to successive hits.

For high speed shaft movement, when the wheel hits a significant obstacle, the high speed damping takes over. This high speed damping is controlled using two components: the main piston shim stack and the high speed adjustment poppet valves. During an impact, the oil pressure builds up in front of the piston as the low speed

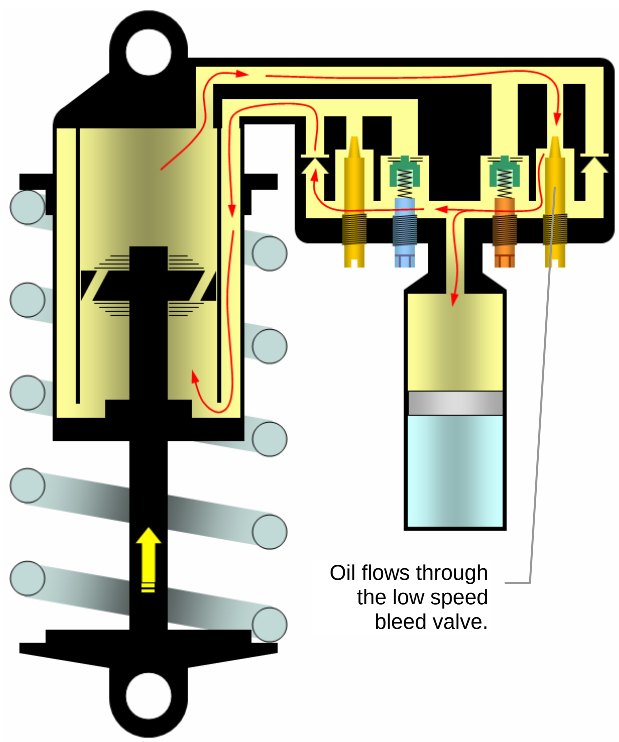


Figure 10: Low speed compression flow

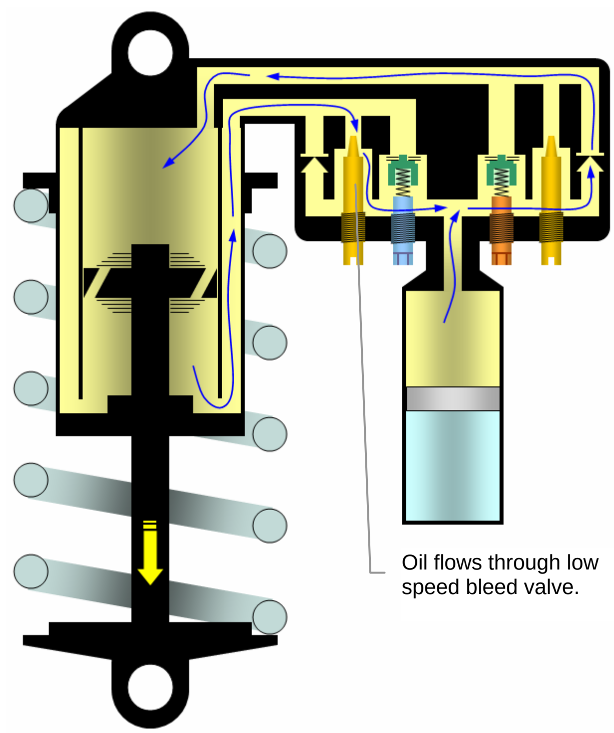


Figure 11: Low speed rebound flow

passages are too small to handle the flow. The oil pushes open the poppet valve and piston shim stack allowing the suspension to move while absorbing the energy from the impact. The order in which these two high speed valves open depends on the settings. The piston shim stack is fairly stiff and will typically open later than the softer, high speed poppet valve. If the poppet damping is increased it may open slightly later than the main shim stack. Either way, this dual path valving enables the greatest control of damping characteristics for the high speed range for both compression and rebound strokes. You can see the high speed oil flow paths in figures 12 & 13.

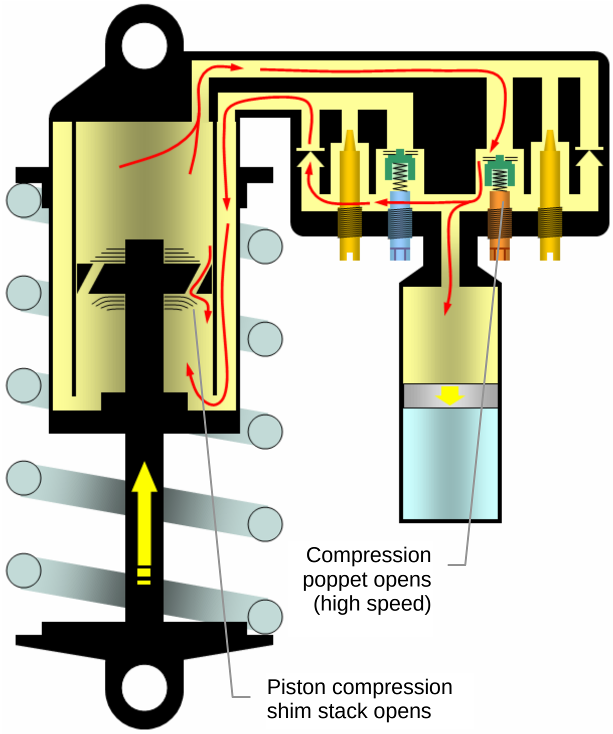


Figure 12: High speed compression flow

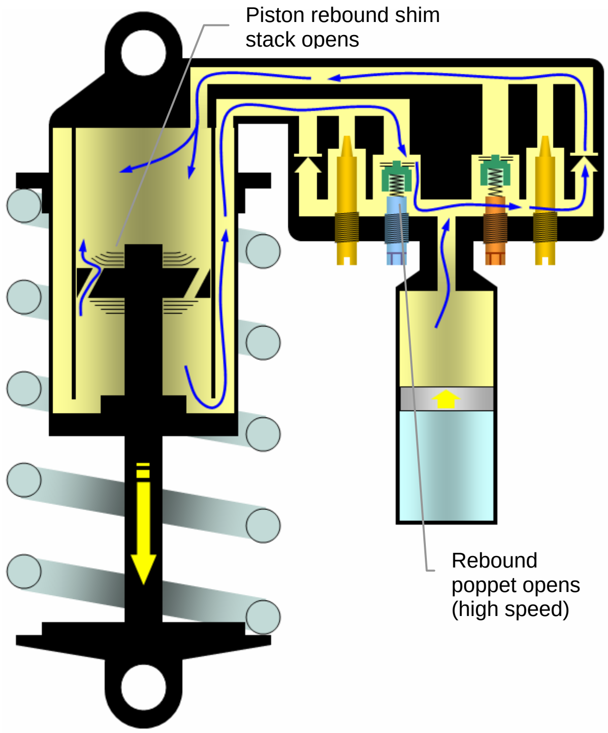
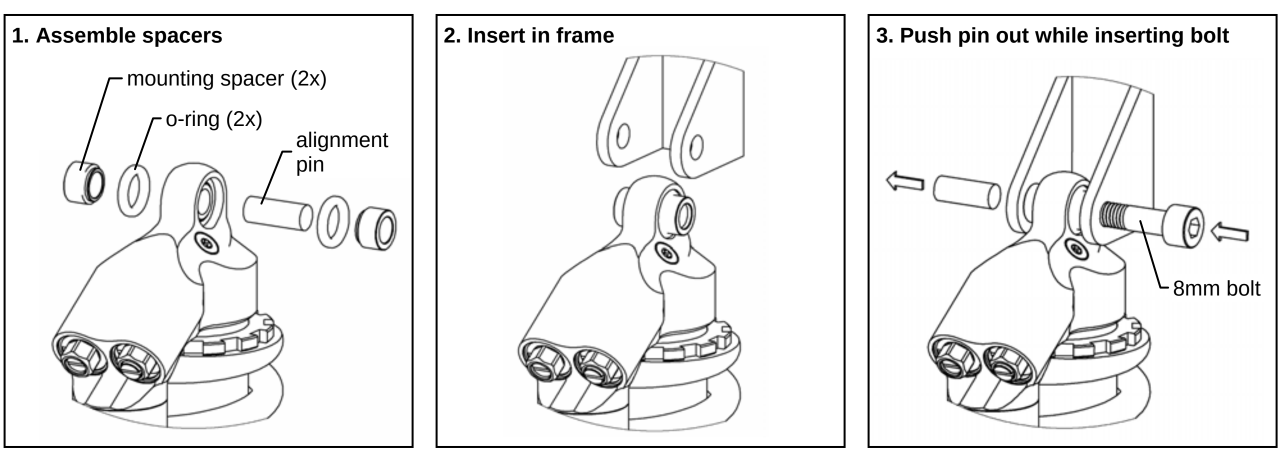


Figure 13: High speed rebound flow

Mounting the DB-1:
When mounting the shock on the frame check carefully to make sure the shock does not contact the frame at any point in the travel. The shock and suspension must move freely without restriction.



Setup and Adjustments:
The first thing you will notice when getting on your bike will be how soft the suspension feels. Don't worry, that is how it is supposed to feel. Suspension is intended to move easily with as little friction as possible. The damping controls of the Double Barrel can handle the big hits even though it feels very soft in the parking lot. Try it and see.

When starting out on the Double Barrel for the first time, use the recommended adjustment settings listed below. Find a familiar section of trail you can ride repeatedly as you make incremental adjustments to the shock. Never make more than one adjustment at a time and only use small increments. The adjusters on the Double Barrel are very sensitive. Even small steps can have a big effect.

Tuning order:
1. Make the necessary spring adjustments to achieve the proper sag setting for your shock.
2. Adjust the High Speed Rebound Damping
3. Adjust the High Speed Compression Damping
4. Adjust the Low Speed Damping settings

Recommended Start Settings:

	Adjuster		**Setting**	**Reference**
Compression		High Speed (hex)	Two (2) turns in from fully open	Open is fully counter-clockwise (all the way out)
		Low Speed (screw)	Eight (8) clicks out from fully closed	Closed is fully clockwise (all the way in)
Rebound		High Speed (hex)	Two (2) turns in from fully open	Open is fully counter-clockwise (all the way out)
		Low Speed (screw)	Twelve (12) clicks out from fully closed	Closed is fully clockwise (all the way in)
Spring Preload		Spring Adjustment Nut	Based on measurements described below	Zero preload is just enough to secure the spring

Inspection and Maintenance:

The DB-1 shock is designed for durability, though, some simple maintenance steps can insure long life and smooth function.

1. Use compressed air to blow away all debris.
2. The shock can be cleaned with a mild detergent.
3. Recommended periodic maintenance is every 100 hours of use. This involves checking the reservoir pressure, inspecting seals, inspecting bushings and possibly changing the damper oil. This inspection should only be performed by a certified Cane Creek technician. Call a Cane Creek technical service at 800-234-2725.

Caution: Do not attempt to disassemble or refill the gas or oil in the shock. Doing so could be dangerous and will void the warranty. Please call a Cane Creek technical service representative. 800-234-2725

Double Barrel Tuning Tips…

	What it does…	What you should know…	How to set it…
Spring & Spring Preload	The spring stores and releases the energy to rebound the suspension to position following a hit.	Various spring rates are available based on your weight, the frame design and leverage ratio. The DB-1 is available with either steel or Titanium springs. A stiffer spring (high spring rate) supports a heavier rider. The spring preload can adjust the sag in the suspension. Turning the Adjuster Nut can add or reduce the spring preload. One turn of the adjuster nut equals 1mm of spring preload.	Measure the shock length with the rear wheel off the ground. Sit on the bike in your normal riding position and measure the length again. The difference between the two measurements should be 30% of the shock's travel. For example, if your shock has 70mm of travel, the difference in length should be 21mm (70 x 0.30 = 21mm). If you don't have enough sag, reduce the spring preload until the measurement is correct. **If you have more than 10mm of spring preload you should use a stiffer spring.**
High Speed Rebound Damping *pewter hex adjuster*	Controls the extension of the shock following a big hit. Rebound damping resists the force of the spring as it expands the shock.	Affects the response of the shock when returning from deep in the travel. Less rebound damping is good because it enables the wheel to return to the ground more quickly. **Full adjustment range is 4 revolutions.**	Increasing the rebound damping will slow down the return of the shock to its full length. If the suspension feels too bouncy or loose, increase the rebound damping. If the feel is hard and bumpy, especially over a series of bumps, decrease the rebound damping. **Make adjustments in ½ turn increments. Clockwise rotation increases damping.**
High Speed Compression Damping *copper hex adjuster*	Controls the compression of the shock for big hits that move the shock's shaft at high velocity. Compression damping assists the spring in absorbing the initial impact of a hit	Affects the bottoming resistance of the shock. More compression damping is good as it keeps the tire against the ground, thus, increasing control. *Note: You will only sense adjustment changes on big hits. High speed has nothing to do with the speed of the bike. High speed refers to how fast the shock compresses.* **Full adjustment range is 4 revolutions.**	Increasing compression damping will reduce the amount of stroke consumed in absorbing a hit. If the shock is bottoming too much, increasing high speed compression damping will improve the performance. If the suspension is too harsh on big hits, reduce the damping. **Make adjustments in ½ turn increments. Clockwise rotation increases damping.**
Low Speed Compression Damping *brass screw inside copper hex adjuster*	Controls the compression of the shock in the pedal stroke and on small, slow bumps.	Low speed compression and low speed rebound damping work together to finely tune the suspension characteristics to your specific needs. Low speed compression damping has the biggest impact on pedal bobbing as it controls how fast and deep the bike will sag with each pedal turn. The low speed rebound controls how fast the bike comes back up. If you restrict pedal bobbing completely using just one adjuster you will loose performance when not pedaling. It is best to balance the pedaling isolation using a combination of the two low speed adjusters. **Full adjustment range is 24 clicks.**	Increasing compression damping will slow the movement of the suspension for small low velocity inputs (like pedaling). If you feel the suspension bobbing too much, increase the low speed damping. **Make adjustments in 2 click increments. Clockwise rotation increases damping.**
Low Speed Rebound Damping *brass screw inside pewter hex adjuster*	Controls frame movement of the bike as a result of pedaling. Controls the response to small, repeated bumps.		Increasing rebound damping will slow the return of the shock for low velocity inputs. If you feel the shock packing up too much over repeated bumps, decrease the rebound damping. **Make adjustments in 2 click increments. Clockwise rotation increases damping.**

CANE CREEK CYCLING COMPONENTS
355 CANE CREEK ROAD
FLETCHER, NC 28732
800-234-2725
WWW.CANECREEK.COM