AVALANCHE SUSPENSION

FOX RACING SHOX

Fox RC4/RC2 SSD High/Low Transition Adjuster Upgrade

AVA ADVANTAGE PROGRAM

Making suspension better for everyone.

Fox RC4 with SSD, Transition and Shape Factor Bottom-out Bumper upgrade.

Why the RC4/RC2 needs to be upgraded?

High Speed Transition Adjuster (T/A) Modification

Low Speed Adjuster Range Doubled (22 clicks)

Boost Valve Removal

Stage 1 (included)

Removing the boost valve and replacing it with our Speed Sensitive Valving.
This fixes the middle to bottom of the stroke by removing the position sensitive portion and making it speed sensitive,
It still prevents bottoming and will now blow-off when needed on high speed square bumps, that the RC4/RC2 fails to do.

Build 1 (select this option in the cart)

For the DW/VP linkages the High/low adjuster will be completely redesigned to create what we are calling a Transition Adjuster (RC4),
this will allow the rider to blend the low speed into the mid speed damping will maintaining pedal performance and low speed plushness.
RC2 will have the same internal modifications, but preset with our custom Transition tune.
The SSD valve will be required for this build to add bottoming resistance and to allow blow-off on square edged bumps as needed.

Build 2 (select this option in the cart)

For rising rate linkages the adjuster will be modified differently to become a High speed adjuster
which will add high speed without adding low to mid speed harshness like the stock fox does now. The RC2 will be preset with our custom high speed tune.
The SSD valve will become an option only if needed for low rising rate systems and more aggressive free riding.

Stage 2 (included)

The main compression valving will be revalved and modified for the linkage system and type of riding.
The rebound valving will be revalved and set for the spring rate needed for the

allowing the rebound adjuster to fine tune the low speed.
The stock RC4/RC2 valving is the same for all spring rates
and the low speed adjustment has to be compromised to compensate for the fixed high speed internal valving.
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Stage 3 (included)

Seals, bushings, and dust scrapers will be changed to better quality and less friction.

Oil replaced with Spectro Suspension Fluid, Recharged with Nitrogen to reduce fade and heat affected pressure increases.

Options 1,2, and 3 (select this option in the cart)

Optional SSD valve(1), shape factor anti-bottoming bumpers(2) and extended reservoirs(3) to increase Nitrogen volume
for racers and more aggressive riders and or rising rate linkages to prevent shock fade and heat related pressure build-up.

Details (included)

Custom revalve and setup for rider, frame and conditions. We will ask you all the right questions to help you help us with the best possible set-up.
Also includes complete rebuild service, new improved seals and dust wiper system, oil, nitrogen charge and typical wear parts* included in price

*(Typical wear parts: shaft seal, dust scraper, shaft bushing, reducer DU bushings, and all internal o-rings)

The larger the reservoir the less pressure increase during full compression, this pressure effects the midstroke harshness for rising rate linkages.
Also the longer the run the hotter the shock gets, and with small reservoir volumes this could double the pressure in the shock at the beginning of the stroke and make it feel topped out or over preloaded.
Regressive linkages like the "Sunday" only benefit from the bottom-out original reservoir. Most frames will work with the standard reservoir.
High rising rate frames and aggressive extended downhill runs on linear and progressive linkages will benifit from the extended reservoir.

Cost $199 including the Low and High speed Transition adjuster mods (RC4).
Cost $199 including the Low speed adjuster mods (RC2).
Optional SSD valve $49, bumper $16 and the extended reservoir $49.

Technical Discussion

Position sensitive damping has one major drawback, the deeper the damper is in the stoke the higher the damping force, this is good for preventing bottoming of the shock but in the real world the terrain has many square edged bumps, rocks and trees. If the shock is deep in the stroke and experiences a square edged hit the compression damping needs to be relieved or blow-off to prevent harsh feel or what is call hydraulic lock. This is prevented from happening with the RC4 damping system. All modern shocks today do this with speed sensitive damping, what we call SSD Technology. This is accomplished by replacing the Boost Valve with a new ported valve and a series of valving shims that react to the speed of the shock shaft not the pressure created by the stroke position of the shaft.

The design of the Boost valve creates a great position sensitive shock. As the pressure in the shock goes up the valve gets harder to open, this creates more compression damping. The pressure can be increased 3 ways, first my adding more air pressure to the schrader valve, second as the shaft compresses, the displaced oil compresses the reservoir floating piston down, which drives up the pressure in the reservoir, and lastly the chamber compensation bottom out can be dialed in to decrease the reservoir volume and thus cause the pressure to be driven up even faster as the shaft compresses. The Boost valve is preset internally to ramp-up at approximately 2/3 the travel and cannot be adjusted externally as it could with the DHX 5.0/4.0 propedal could with the external knob, pressure and bottom-out can change when it kicks in, slightly before or after the preset position.

So this all sounds great but in a real world where courses and terrain are not perfectly smooth and void of square edge holes, this is where the Boost valve system fails to allow the valve to blow-off. When the shock hits square edge bumps deep in the stroke the valve becomes harder to blow-off and is actually getting firmer the deeper it gets in the travel (Position sensitive damper).

This is why the Speed Sensitive Damper (SSD) is preferred, as the shaft speed needs to increase the compression adjustment valve needs to blow-off when the bumps become square edged or what we call high speed hits. This creates the need for the conversion and replacement of the Boost valve system to a shimmed ported valve. Since the shim stiffness is not affected by the build up of pressure in the reservoir, the shims can create damping at low and medium speed compression hits and be valved to blow-off when higher shaft speeds occur thus allowing the damper to smoothly resist the square edged hits. Because the main piston was valved for a very progressive position sensitive Boost valve we can now revalve the main piston to contribute to the compression circuit and due to the decreased ramp up in the overall spring rate of the damper, the rebound stack can be revalved to be more linear . The main piston can now control it's 60% share of the compression damping giving us many more tuning options for rider set-ups. Rebound can be tuned to be more reactive on small bumps and provide lift where needed while preventing that pogo stick feel. Increased reservoir volume reduces pressure build up deep in the stroke, reducing heat build-up and increased oil and seal life. Optional reservoir volume systems available as shown below:

What's been done

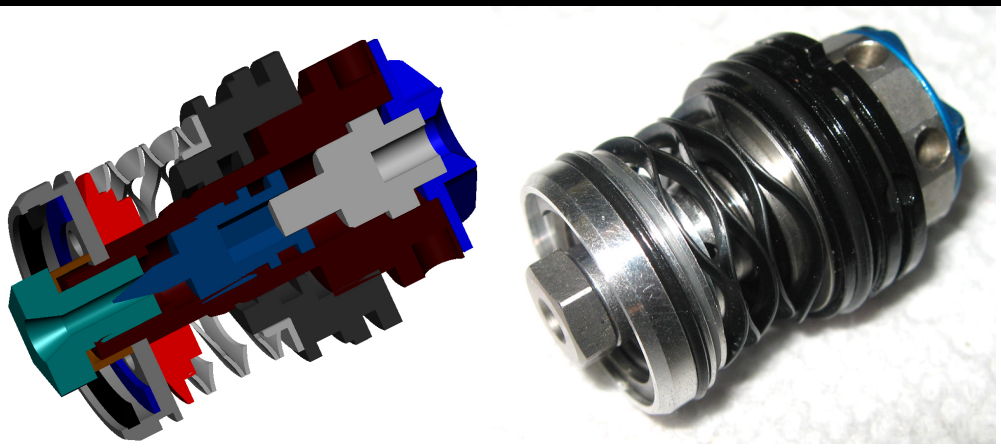
The RC4 is completely disassembled

Boost Valve removed

SSD valve set-up with high speed shim stack based on linkage and rider ability

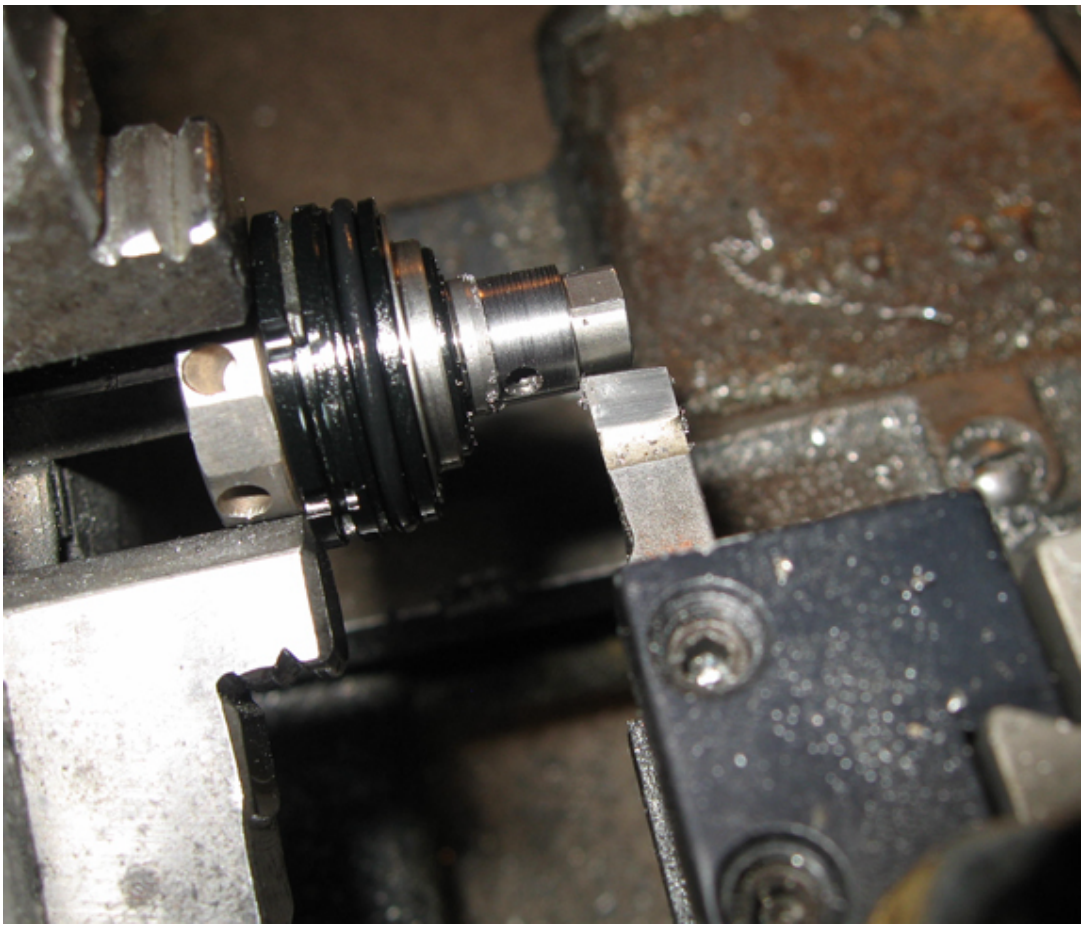
SSD valve installed in place of Boost valve

Avalanche Advantage SSD Modification
Conversion to High/Low Transition Adjuster

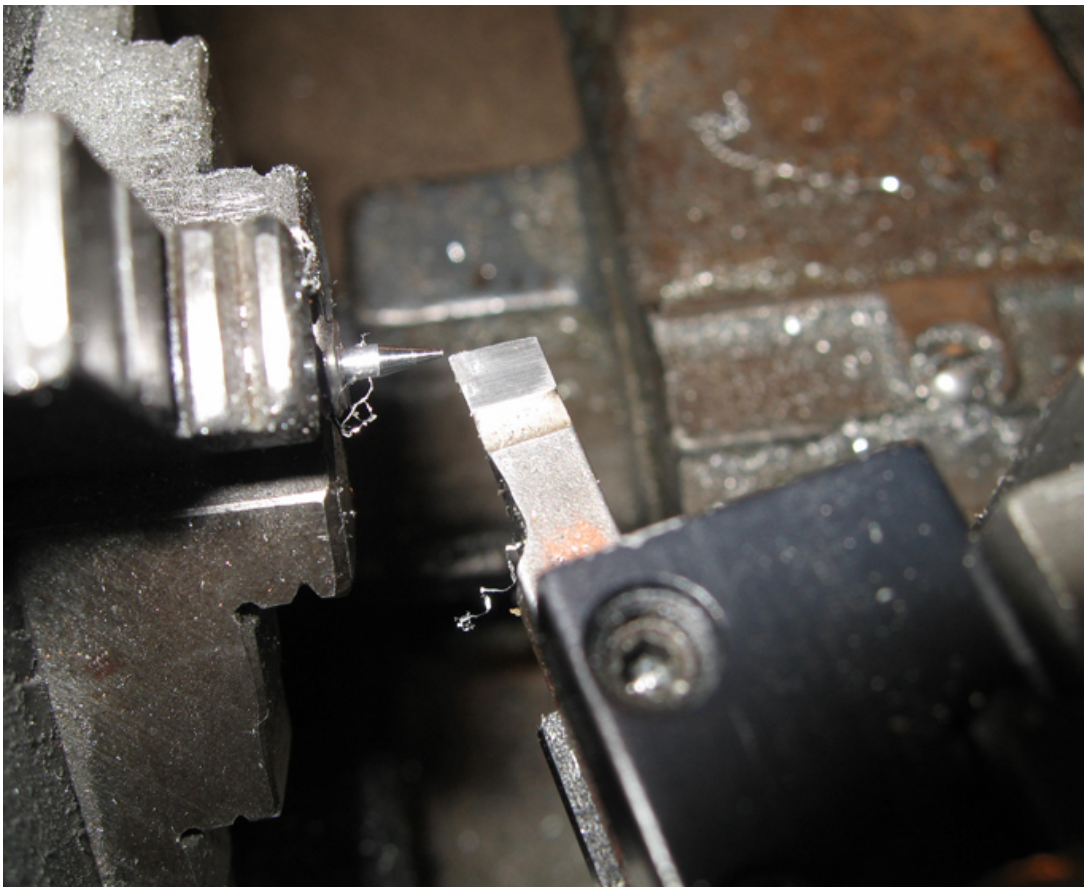


Low Speed Plunger and High Speed Valve

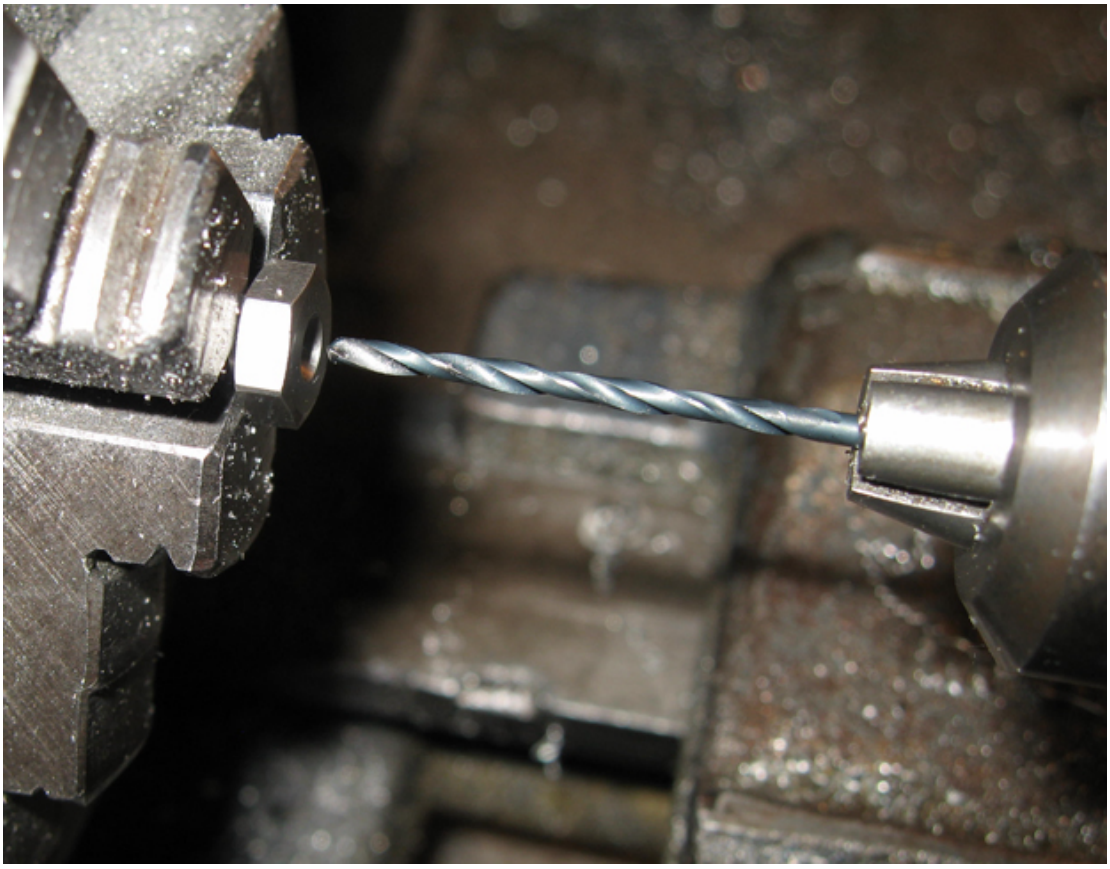
Disassemble High/Low speed adjuster



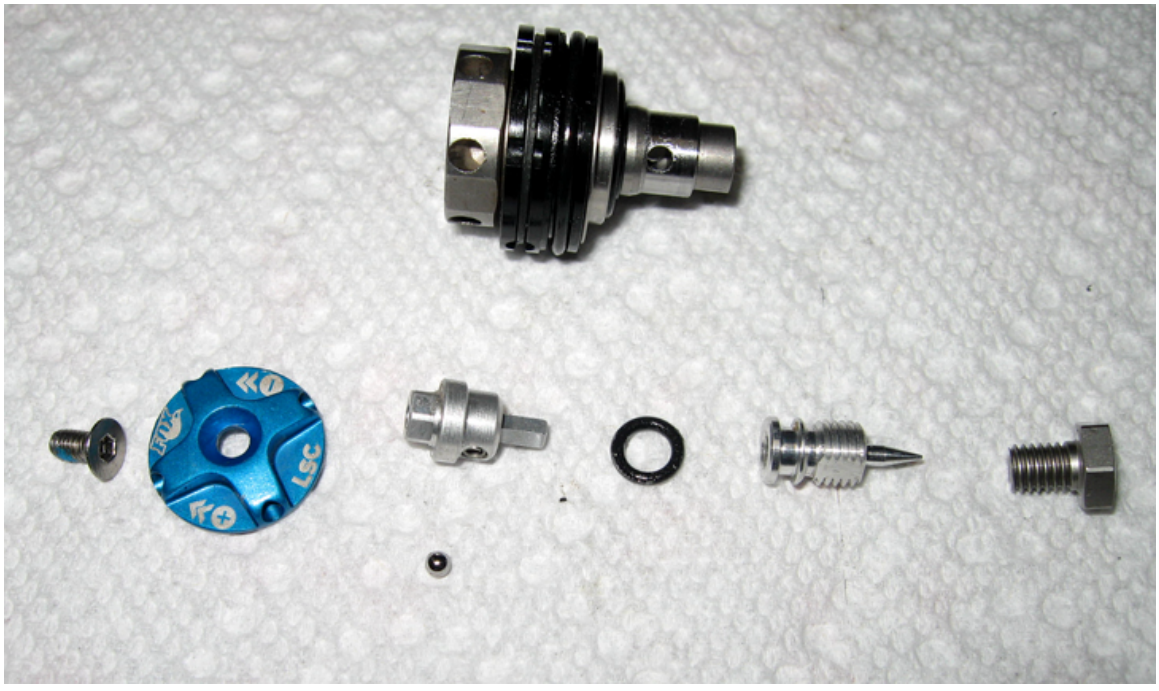
Modify High Speed arbor to accommodate Transition Adjuster piston



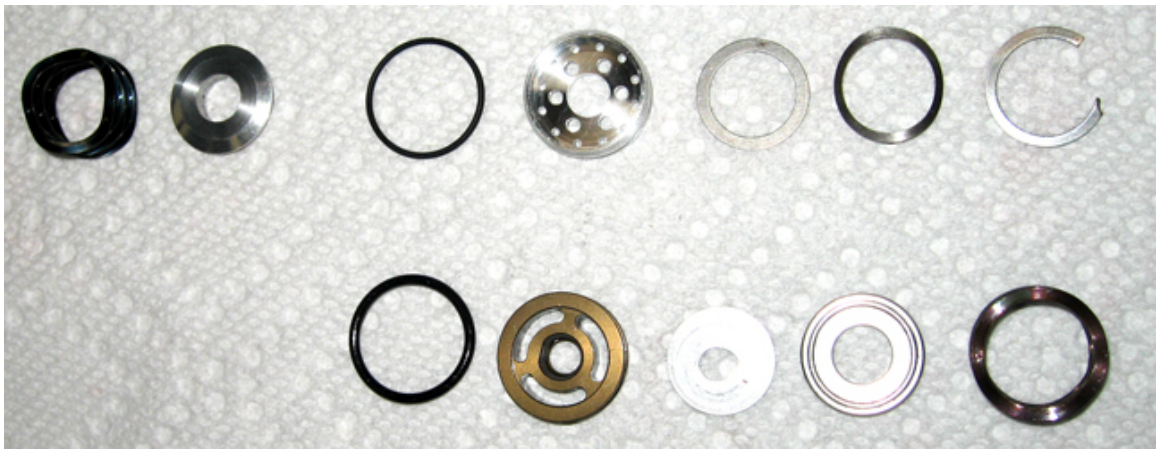
Change needle taper for wider adjustment range



Increase Low Speed bleed for bigger needle taper



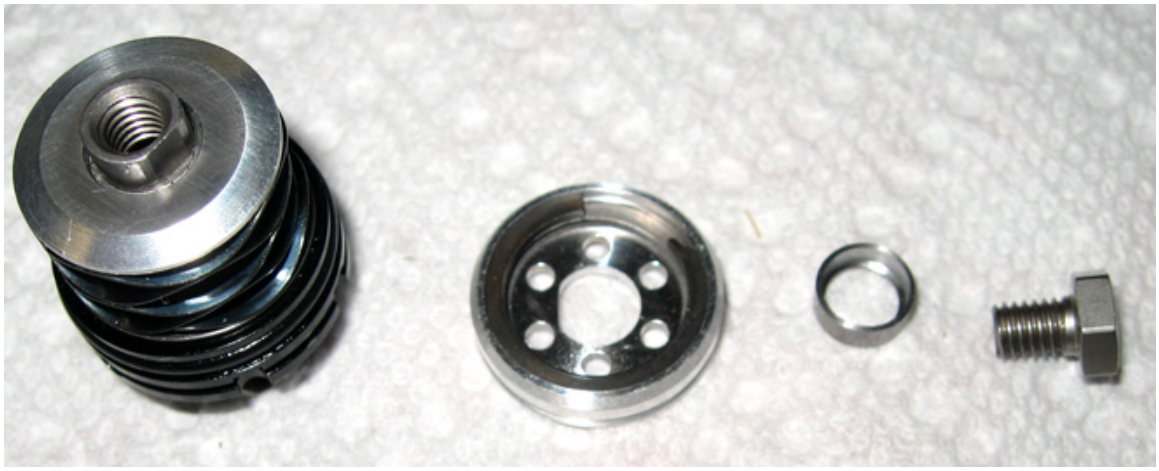
Low Speed Adjuster exploded view
wider range -22 clicks vs 16
%50 increase



AVA above, Fox Below
High/Low Transition valve vs stock high speed valve

Close up difference Fox vs AVA

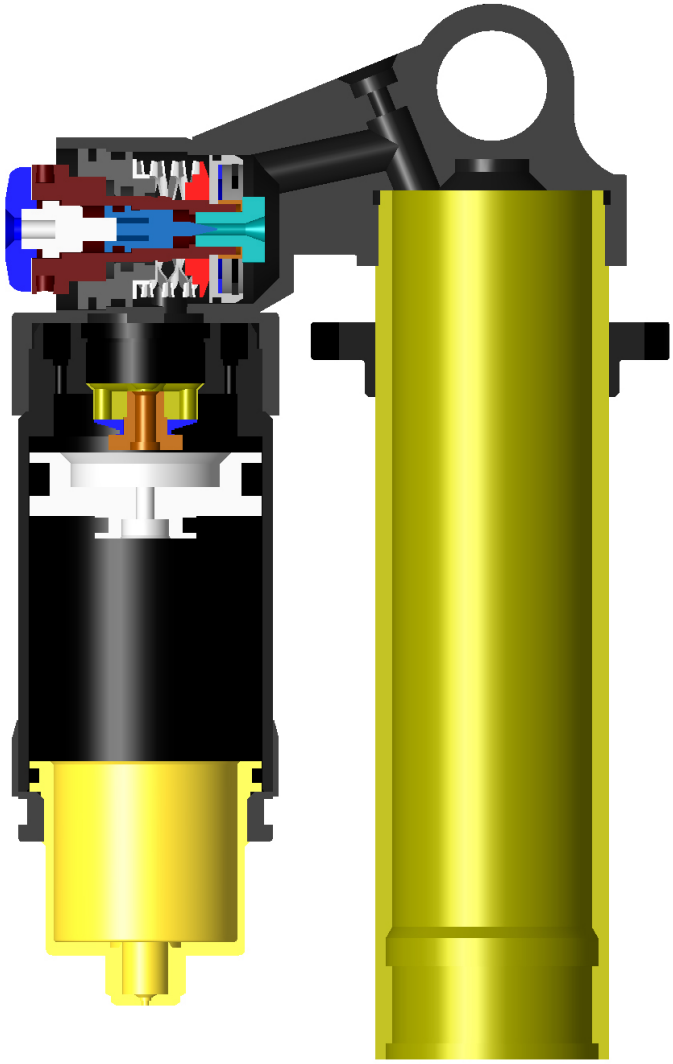
High/Low Transition valve vs Fox high speed valve



High/Low Transition valve exploded view
Medium wave spring shown (soft and firm available)

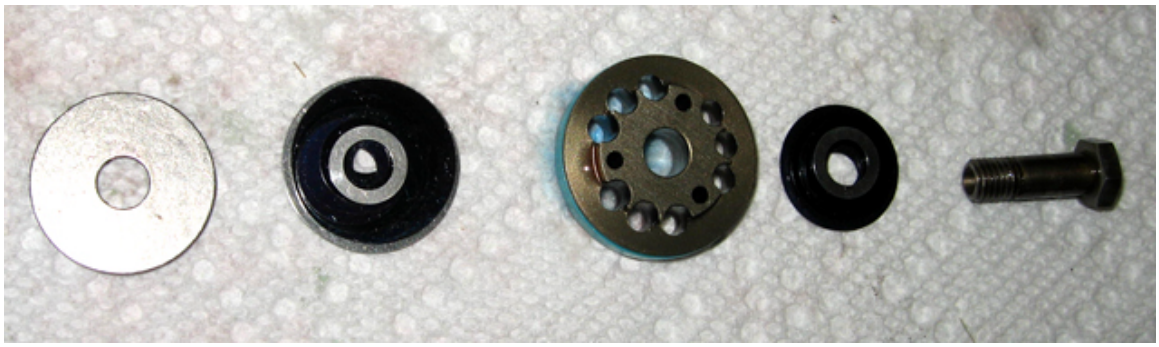
High/Low Transition Adjuster Assembled

22 clicks Low Speed and 12 clicks High Speed



Transition Adjuster and SSD valve shown installed

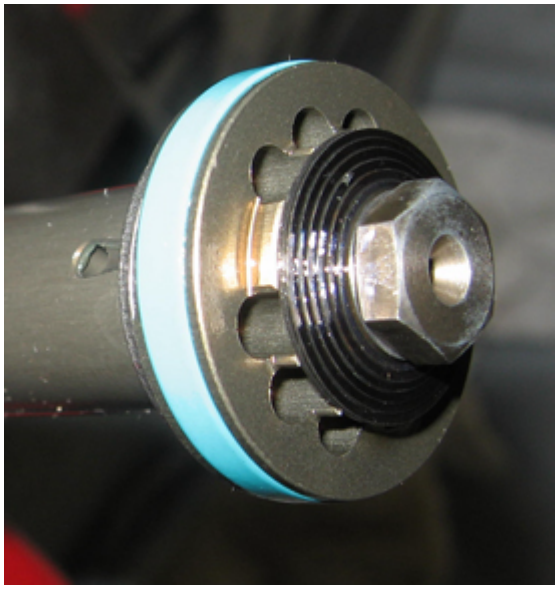
Main Piston Revalved



Compression revalved to rider style/speed and linkage

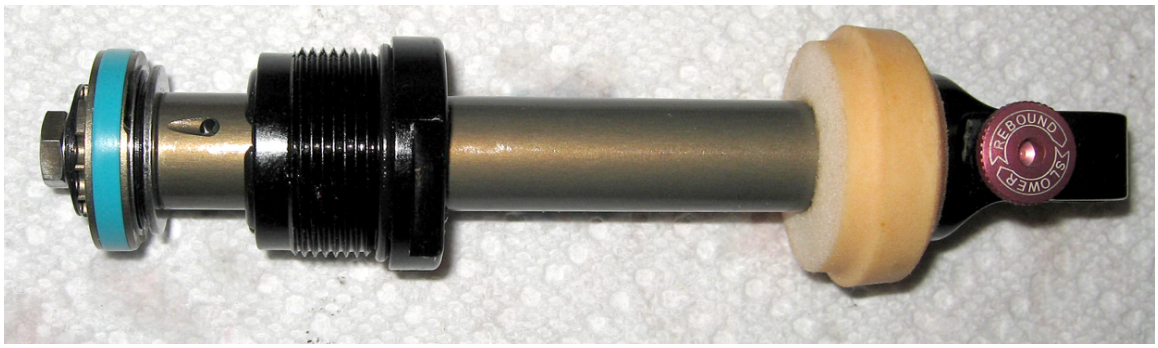
Rebound revalved to rider weight(spring rate) and type of riding

main piston and piston bolt remain unchanged



Main Piston shown with revalved shims installed

Seal head rebuilt with low friction triple sealed system

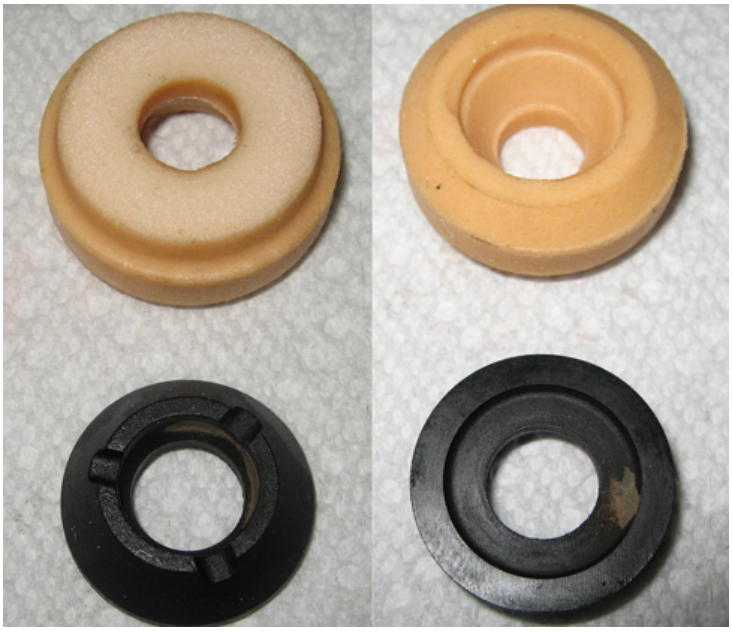


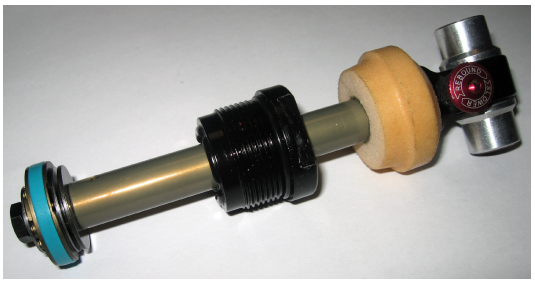
Specifications:

Increased range of Low Speed Compression- 22 Clicks
High Speed Adjuster/Transition –12 Clicks
16 mm Speed Sensitive damper controlled 4 port SSD Compression Valve- revalvable for high speed bottom out control
Nitrogen charged to 120 psi, fixed (i.e. no need for adjustment now)
Retains bottom out system to aid with pressure ramp up needed for regressive linkage frames
Low friction main shaft triple Seals
Shape Factor Bottom-out Bumper, optional
Extended Reservoir rubber plug cap for maximum volume, optional

An Optional Improved shape factor anti-bottoming MX-style urethane bumper has been installed.

Fox anti-clunk rubber bumper replaced with:





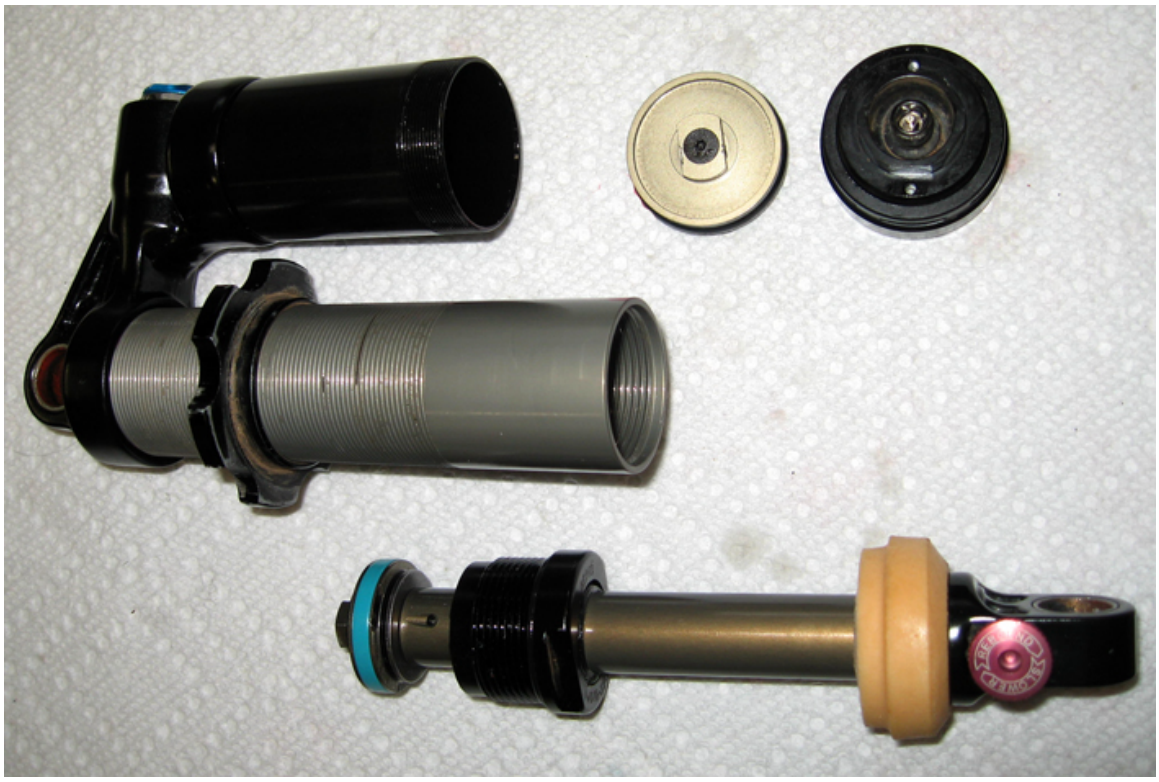
Avalanche Advantage Shape-Factor Anti-Bottoming Bumper Progressive Bottoming Control (PCB)

Top View

Bottom View

This compresses inward constrained by the spring inside diameter making the bumper ramp-up to resist bottoming in the last ½ inch of travel. Because the bumper is made of closed cell Urethane it can compress to a very small volume allowing full travel of the

All O-rings and seals replaced



Shock reassembled with Spectro shock fluid and recharged with nitrogen.

How it works now.
&
How to set-up your Avalanche Advantage SSD upgraded RC4.

Speed sensitive damper technology means that at any shaft speed the damper will adjust flow of oil in the damper to adjust for the shaft speed. As the damper shaft speed increases the damper will produce more damping forces unless it is relieved by some means. The point at which the damper relieves itself can be controlled by the valving shims or blow-off valves. The art of tuning these valving shims and blow-off systems is called revalving. A properly revalved damper will provide the necessary damping for absorbing bumps and jumps while relieving the damping as needed during square edge hits to prevent harshness. Knowing your weight, ability, riding conditions and type of linkage progression a suspension tuner can revalve and set-up your shock to meet these conditions. The compression and rebound adjusters provide the rider with a means to fine tune your suspension to your desired needs.

Spring Rate and Sag

Choosing the proper spring to support your weight is the most essential first step. Your suspension tuner will help you determine this rate. The spring should compress approximately 30% the travel (stroke) of your shock. I.E. for a 3 inch stroke shock the sag will be 30%*3.0 inches = .9 inch of sag. This is called the proper sag. Sag can be adjusted by adjusting the preload on the spring. Tighten the spring preload collar to decrease sag and loosen the preload on the spring to increase sag. The maximum preload is 3 to 4 turns on the preload adjuster after it first contacts the spring; the minimum preload is 1-1/2 turns. If you have too many turns of preload on your spring your low speed rebound damping will be over stressed, too little and the shock will not fully extend for the next bump and cause packing. Too many turns means you will need a slightly stiffer spring and not enough turns you will need a softer spring. When between spring rates, a softer spring will provide less pedal bob because of the increased preload and a stiffer spring with less preload will loosen up the initial travel and add more progression to the suspension.

Low Speed Rebound Adjustment

Once your sag is set properly the rebound adjuster can be set for the ride conditions, standard position is about 7 clicks counterclockwise out from full slow. Turn out 1 click to speed up rebound, this will make it absorb small close together bumps easier. Turn in 1 click to slow up rebound when absorbing big bumps to prevent kicking up. Repeat click at a time until desired results are achieved. Faster rebound is more desirable when trying to achieve plusher setting

Low and High Speed Compression Adjustment

The low speed compression (LSC) adjuster is used to set the low speed firmness of the damper, 11 clicks from full (+) is the standard setting. Turn the adjuster knob in 2 clicks clockwise (+) to increase LSC damping, i.e., for large rolling bumps. Turn the adjuster knob counterclockwise (-) 2 clicks to decrease LSC damping, i.e. for small bumps and loose conditions. Repeat click at a time until desired results are achieved. Too little damping will cause the suspension to ride to deep in the stroke, using up most of your stroke causing a harsh ride.

The high speed compression (HSC) adjuster(outside ring of holes) is used to set the high speed firmness of the damper and to determine when and how the low speed adjuster transitions to midspeed damping, 6 clicks from full (+) is the standard setting. Turn the adjuster knob in 1 clicks clockwise (+) to increase HSC damping, i.e., for large jumps and drops. Turn the adjuster knob counterclockwise (-) 1 clicks to decrease HSC damping, i.e. for square edged hits. Repeat click at a time until desired results are achieved. The lighter first 3 clicks determine how the low speed transitions into the midspeed and can be used in conjuction with the low speed adjuster to create a midspeed damper tune.

For the RC2 the high speed compression (HSC) has been preset internally with the high speed preload set in the middle for your riding ability, terrain and linkage. The valving has been pretuned by us to achieve optimum damping while still able to blow-off on the medium to larger high speed square hits. Adding more low speed compression will cause the high speed circuit to engage slightly sooner and vice versa.

Bottom-Out Control

The nitrogen chamber bottom-out control on the the RC4

If you elect to retain this feature can add an additional spring force to the damper at the end of stroke to improve bottoming resistance on regressive linkage systems. We do however recommend that compression and proper spring rates are tried first, decreasing the chamber volume will cause a harsh midstroke as the shock heats up, the larger volume adjust will have the least affect on the reservoir pressure. The reservoir piston height is set to maximize the nitrogen charged reservoir. The nitrogen charge is set to a fixed pressure based on the compression valving, this is no longer an adjustment feature on the RC4 damper, decreasing the pressure will not soften or alter the damping in anyway, if released it will damage the set-up of the shock and cause air bubbles to form in the oil during use and cavitation will occur when the nitrogen pressure is not sufficient enough to prevent oil pressure to be reduced below the vapor pressure of the oil during extreme damping conditions.

Warnings:

Under no circumstances should the nitrogen pressure be changed, discharged or checked with a gage as it will disrupt he pressure on the shock oil causing it to foam and cause air bubbles to form under higher damper forces. It is no longer an adjustment feature after conversion to a Speed Sensitive Shock.

Service and maintenance.

We recommend you have you shock serviced by an experienced shock technician yearly or every 100 hours of riding for optimum performance. The oil heats up and absorbs wear particles causing its damping action to decrease over time. The nitrogen charge will also need to be recharged every year regardless of the number of hours used as it will slowly leak down or be absorbed by the oil and o-rings. Do not check the nitrogen pressure with a gage, as the gage will absorb most of the pressure in the reservoir during the test. Do not release the nitrogen charge rapidly during recharging, as it will cause bubbles to for in the oil. The state of the nitrogen charge can be tested by removing the spring from the damper and pressing the shaft against a bathroom scale, readings should fall between 35-40 lbs.

Frequently asked questions and terms.

Why do I have to use nitrogen pressure for the reservoir charge…Nitrogen is a dry inert gas that helps resists pressure changes from heat build-up in the reservoir.

Why is the air pressure adjustment feature no longer used… The speed sensitive valving technology uses a minimum pressure to prevent cavitation, reducing this pressure will damage the oil and not make the damping feel softer.

Eye to Eye: Is the length of shock between the two mounting hole centers.

Sag: Is the amount of shock (& rear wheel) compression caused by the riders weight while sitting on the bike in a normal riding position.

Spike: Is the harsh feeling that occurs when riding over hi-speed bumps if the shock cannot compress fast enough to absorb the size or sharpness of initial bump contact.

Bobbing: Is the up and down (power loss) movement of your suspension that occurs from weight shifts of the rider during pedaling.

Blow-Off: Is the shocks ability to relieve the pressure caused by high speed pressure build-up in a damper valve.

Disclaimer

Avalanche Suspension Inc. is not responsible for any damages to you or others from riding, transporting or other use of your Avalanche Advantage Fox RC4/RC2 Shock or mountain bike. User fully understands that mountain bike riding and/or racing is dangerous and hard on equipment. In the event your Avalanche Advantage Fox shock breaks or malfunctions, Avalanche Suspension Inc. will assume no liability or obligation beyond the repair or replacement or your shock.

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