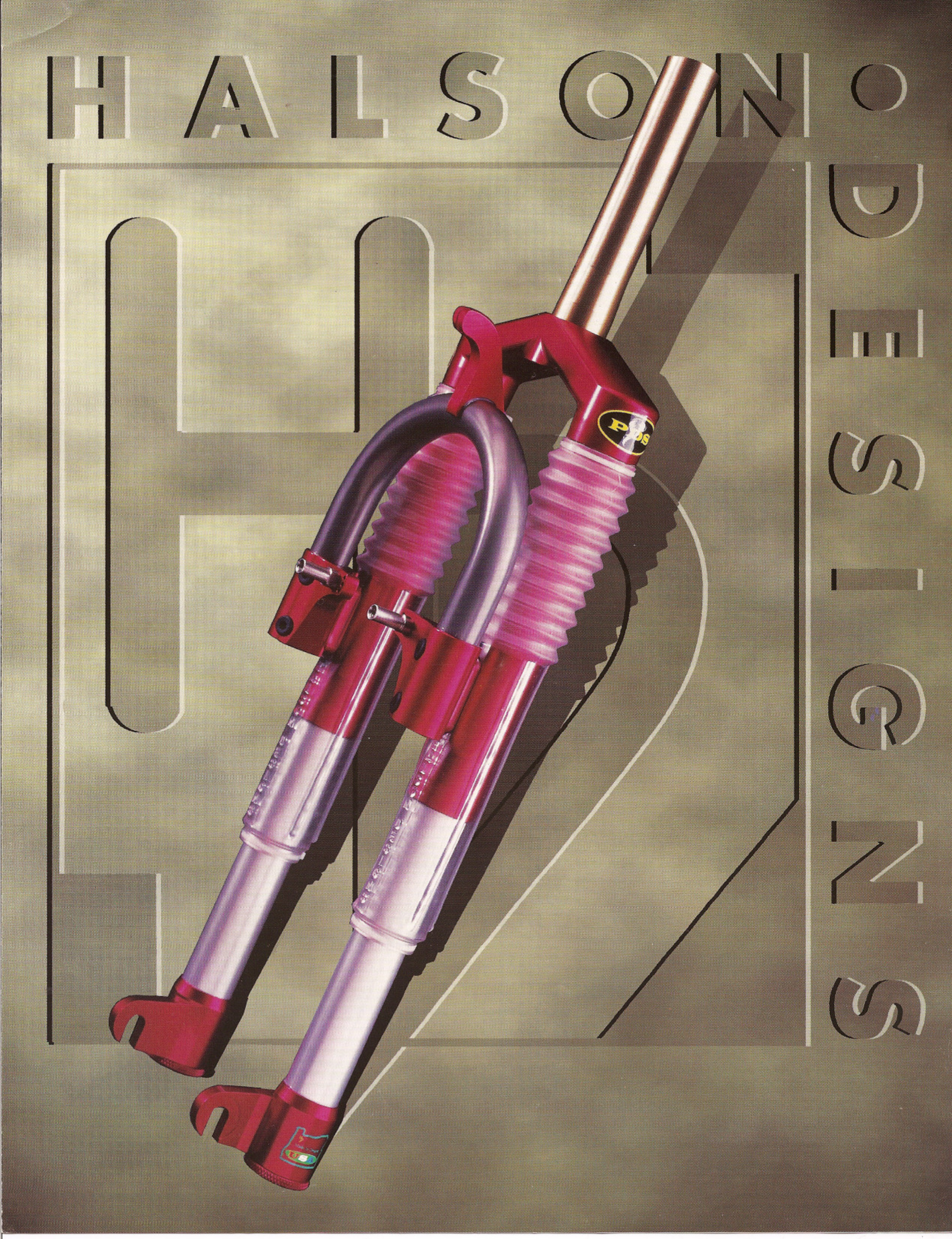

HALSON
DESIGNS
PDS

"INVERSION PDS"

The most technically advanced, high performance, suspension fork available. (And now it looks like it too!)
Taking it from the top.............here's the run down:

"Inversion PDS" is designed and manufactured in the USA and assembled at Halson's own facility in Wilsonville, Oregon. Each part is made to compliment the overall performance of the fork as a system. But, lets analyze a few areas individually to see how a Halson product is **superior.**

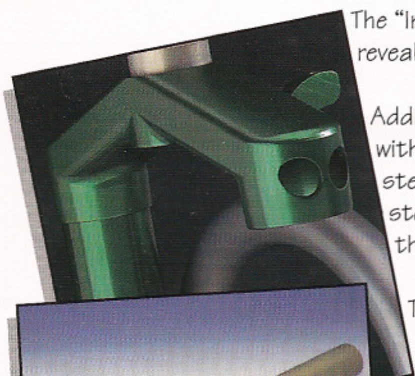
Structure

THE CROWN AND STEERER

One of our overall goals is to make a fork as stiff and strong as possible for a given weight. The quest starts in the crown as it is one of the most highly stressed components of a bicycle. The legs of the fork have a tremendous amount of leverage against the crown. As they try to move forward and backward during riding, they load the crown **in torsion.** Any twisting in the crown gets magnified by the length of the legs resulting in even greater movement at the axle. This means you lose steering feel and control.

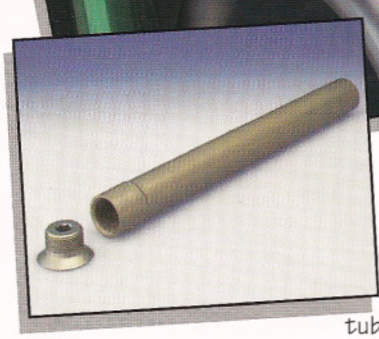
Now look at a typical crown. Most are either forged or machined, and material is removed from the underside of the crown to reduce weight. The problem is that this creates a "C" section which is terrible at resisting torsional loads.

Often the crown is further weakened by slots and pinch bolts to allow for interchangeable steerer tubes or stanchion tubes. The slots become hinge points allowing even more flex and the pinch bolts cause stress concentrations which often result in cracks.



The "Inversion PDS" crown is very different from a typical crown. The cross section of a Halson crown reveals a closed section which is the most efficient way to resist torsional loads (i.e., a drive shaft).

Additionally, we developed our patented taper fit steerer tube system to provide interchangeability without compromising crown integrity. No slots. No pinch bolts. No non-sense. The end of the steerer tube (where it engages the crown) is tapered to match a tapered bore in the crown. The steerer tube is put into the crown from the top and then secured from below with a bolt that threads into the steerer tube and seats against the underside of the crown.



The result is a mechanically locked press fit. The interface of the crown and steerer is very uniform and sound, yet it can still be disassembled. All of the steerer tubes have the **same** tapered end to engage the crown, so you can interchange between aluminum or chromoly steerer tubes in 1.000", 1.125", or 1.250" diameters.

STANCHIONS AND SLIDERS

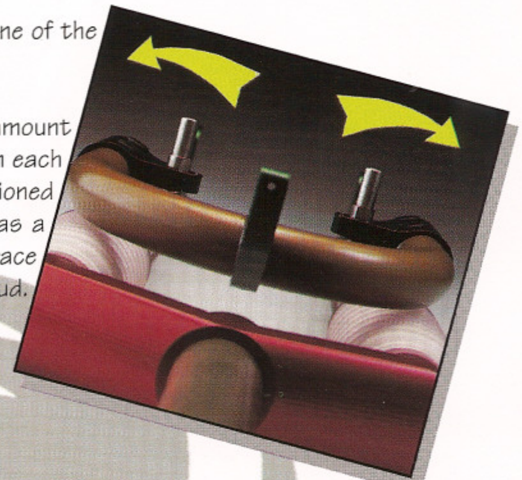
The next highest load on a fork is just below the crown in the stanchion tubes. The larger diameter tubes of "Inversion PDS" are approximately **twice as stiff** as the smaller ones. Therefore, the larger ones are used as the stanchions (stationary tubes attached to the crown) and the smaller ones are used as the sliders (tubes attached to the wheel which slide up and down). This is commonly referred to as an upside-down fork when really it is right-side up.

Of course to do this, we had to overcome the problem of keeping the brakes aligned with the rim. The brakes need to move up and down with the wheel, so they are attached to the same tube as the wheel through slots in the stanchion tubes. (Patented)

In addition, the stanchion and slider tubes are specially tapered and contoured to maximize strength and minimize weight.

Slider/Stanchion overlap and bearing separation starts at 6" and extends to 8.5" at full compression to further enhance rigidity and to reduce stiction.

Brace



The brace on any telescoping suspension fork must perform a variety of functions. One of the highest loads on the brace is brake spread.

When the brakes are applied to the rim with a given amount of force, there is an equal amount of force trying to spread the brake mounts apart. The brakes try to rotate away from each other around the center line of the legs. This loads the brace in torsion. As mentioned before, a closed section is most efficient for resisting torsion, so "Inversion PDS" has a huge tubular brace to resist brake spread and give unsurpassed brake feel. And, the brace is actually wider than the fork to provide plenty of clearance for big tires and lots of mud.

Function DAMPERS AND SPRINGS:

WHAT ARE SPRINGS FOR?

The springs support the weight of the bike and the rider. When the fork gets compressed from hitting a bump, the spring returns the fork to full length. The springs don't really absorb any of the impact. They store the energy and then return it.

WHAT ARE DAMPERS FOR?

Dampers are what "absorb" shock by changing the energy of motion, into heat, and then dissipating it. Dampers can be made to work on the compression stroke, the rebound stroke, or both.

Rebound damping: A rebound damper doesn't do anything when the fork gets compressed. All the energy of the hit is stored in the spring. Then the rebound damper controls the spring on the return stroke.

The **advantage** is that no shock is transferred through the damper. The fork begins to compress immediately upon encountering a bump.

The **disadvantage** is that a spring is not "speed sensitive." It cannot compensate for how hard or how fast the hit is. When the spring is the only thing controlling the compression of the fork it must be stiff enough so it doesn't bottom out on big hits. Therefore, it will be too stiff on medium and small hits resulting in a loss of ride quality and traction.

Compression damping: If a damper works on the compression stroke, it changes a portion of the energy of the impact into heat and there is less energy stored in the spring.

The **advantage** is that the spring can be softer so that it works well over small and medium bumps. When you encounter a big hit, the damper helps the spring so the fork doesn't bottom out.

The **disadvantage** is that the damper **transfers** a certain amount of **shock** to the rider. Upon impact, an oil damped fork is actually rigid for few milliseconds until the oil in the damper begins to move allowing the fork to compress. It is similar to doing a belly flop. Shock is transferred to your body before the water moves and your body sinks.

Typical fork makers settle for one of these two systems. Of course, for the latest Halson fork we wanted the advantages of **both** and the disadvantages of **neither.** And we got it because we designed a new damping system **specifically for mountain bikes** rather than simply adapting current motor vehicle suspension technology to a bicycle.

"Inversion PDS" uses damping primarily on the compression stroke to get the advantage of being able to run the softer spring rate, but we avoided the disadvantage of shock transfer by developing **P.D.S. (Pneumatic Damping System)** (Patented). P.D.S. uses air as the damping medium rather than oil.

WHY?

"Inversion PDS" reacts instantly to any bump because it doesn't have to move a mass of oil first. Upon initial impact, the **air** in the damping chambers will **compress** and allow the fork to be super supple and sensitive. Yet, when the velocity or size of the impact is higher, pressure builds in the damping chambers to slow the rate of compression. The pressure bleeds off through the valving and energy is absorbed without the fork ever feeling harsh.

HOW?

With an air damper, there is critical relationship between the diameter of the damper piston, to the stroke of the damper and the weight of the vehicle.

To use air dampers on a heavy vehicle the diameter of the piston would have to be so huge that it would be impractical or impossible, but if the piston is too small, then the damper will be ineffective due to over compression of the air. So, heavier vehicles have to use fluid (usually oil) as an alternative. Since fluids don't compress, the diameter of the piston is much less important. A relatively small damper can control the motion of a large and heavy vehicle. Shock transfer is not such a huge concern with heavy vehicles because they can mask it with their weight..... but your bike can't!

The diameter of the "Inversion PDS" fork legs are able to house a piston with a diameter that is appropriate for the weight of a bicycle and rider. We do not need to compromise by using oil. Instead, we can utilize air and have the advantages of effective damping **without shock transfer.**

In addition to reducing shock transfer, the PDS dampers are travel sensitive. Damping in the initial part of the stroke is very light, this allows the polymer to be sensitive to the small and medium size hits. The deeper into the travel you go, the more compression damping there is to resist bottom out. This is a natural feature of air damping (due to the compressibility of air), but oil dampers are not progressive in this way without heavy, complicated, expensive valving. Therefore most makers don't provide it.

Another advantage to air damping is eliminating fade. Oil dampers have a finite amount of damping medium (oil). As mentioned earlier, damping is really changing the energy of motion into heat. During long, hard riding or a fast down hill, the oil can get hot and thinner in viscosity. Once this happens it moves through the valving faster and easier which means inconsistent damping and less control of the bike.

The dampers in the "Inversion PDS" breath outside air. A portion of the air is exchanged with the atmosphere in each stroke of the fork. The dampers keep cool, so "Inversion PDS" remains fade free no matter how far or how fast you ride.

Other obvious advantages are no leakage problems and weight reduction. Since air is lighter than oil we can use a damper in each leg of the fork to balance the forces and avoid unnecessary loading of the brace. So, although the PDS system is actually more complicated to design, it is very simple and reliable in operation.

We did the work.......you enjoy trouble free high performance.

Springs:

Polymer is used as the spring in many suspension systems due to its internal damping characteristics for small to medium size hits. With the help of engineers at Uniroyal, we developed our own specially formulated microcellular urethane (MCU) springs with specific characteristics to match the dampers. The MCU springs are lighter and much less temperature sensitive than cast urethane springs.

Each leg contains two 4" MCU's on Halson's skewer system (Patented). A variety of springs are available and can be interchanged to tune the fork for rider preference and rider weight after simply unscrewing the threaded caps at the bottom of each leg.

Specifications:		*Options*	
Ride Height:	16.7"(w/o sag)	Steerer :	7050 T-6 Aluminum-Threadless
Offset:	1.5"		4130 Cr-Mo-Threaded
Travel:	2.5"	Colors:	Hard Anodized-Red, Blue,
Weight:	3.2 lbs.(w/o steerer tube)		Green, Purple, Gray, Black,
			Limited edition -Rasta
		Brace:	With or without hanger

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