

AMP RESEARCH B-4

The latest evolution of Horst's big idea

■ To say that AMP designer Horst Leitner is unencumbered by traditional bicycle design philosophy would be an understatement. The Austrian-born, Laguna Beach, California-based industrial designer came up through the ranks of casting factories, motorcycle building and automotive component manufacturing—he is quite at home in the austere world of post-modern efficiency. His latest mountain bike is a study in functional pragmatism. Even its name, the B-4, is more of a chronological designation than the typical anthropomorphic moniker.

When Horst breaks the rules, he breaks all of them! There is little visual resemblance to the classic, road bike-derivative, diamond-framed hardtail in the AMP Research B-4's profile. Its interrupted-seat-tube front section has a bolted-on subframe and a head tube junction that is reinforced with rarely seen motorcycle-type plate gussets. The entire frame bristles with CNC-machined couplings and stainless steel Allen-head hardware. More than any bike on the planet, the B-4 foretells the techno-future of off-road bikes. It's visually stunning and technically dazzling. Even more scary for the traditional framebuilder is the fact that AMP Research makes every part: the frame, the disc brakes, the shock, the seat clamp and the fork.

When you begin to add up the AMP's anomalies, you begin to see that the B-4 is the logical permutation of traditional mountain bike philosophy.

IS THE AMP B-4 DESIGN THE BLUEPRINT OF THE FUTURE?

The AMP B-4's seat tower-style subframe and interrupted seat tube help form a low-profile top tube, which compensates for the higher bottom bracket that suspension bikes require. The B-4 is wrought from Alcoa CU-92 alloy (now designated 6013). The B-4's stamped seat tower (subframe) supports the truncated seat tube while straddling AMP's minuscule, thru-shaft, hydraulic rear shock. The bolt-on subframe is a unique, formed, sheet-aluminum structure that provides adequate strength without the unwanted width and bulk of a tubular space-frame. The bolt-on seat tower is available in different heights and angles to make the frame adjustable to a wide variety of body styles.

The thru-shaft shock is well suited to MacPherson strut applications because

the shock's shaft slides on two widely spaced bearings at each end of its housing (the shock shaft actually goes through both ends of the shock). AMP spent considerable time researching shock durability (an ongoing process) and promises a titanium-nitrate-coated shaft, quad-lip oil seals and an anti-hiss feature by the time the '96 B-4s hit the showrooms. Shock hiss, better known as *AMPphysema*, is considered AMP's most endearing, or irritating, trait—depending on your outlook.

The B-4's front section is wrought from two straight-gauge alloy tubes. The top tube is bent in two places to clear the shock and form the lower part of the frame's seat tube. The rear of the B-4 follows the basic AMP blueprint. The swingarm pivots about an inch above the bottom bracket. The swingarm and compression strut feature slender, CNC-machined alloy crowns. The finer features of AMP's machined stay crowns is that a decent amount of tire and chain wheel clearance is designed into the machining to minimize the effects of chainsuck and mud on the B-4's forward progress. Of course, the rear wheel is attached to Horst link dropouts (as you would expect), and the left dropout is drilled to accept a rear AMP D-1 hydraulic disc brake. Creatively, AMP no longer routes the cables along the top tube and compression strut—a common practice that results in ghost-

shifting and funky cable performance on many suspension bikes. Instead, AMP has gone against the grain by routing all the B-4's cables on the down tube. Routing the rear derailleur cable under the bottom bracket and through the inside of the right swingarm prevents the cable from tracing the arc of the shock. True, it is unusual, but the cable routing is very trick. To further extend the life of the AMP's cables, the last two feet of housing is a continuous run.

Even to traditionalists, the B-4's pared-down appearance has no wasted hunks of metal. Each frame tube is just large enough to handle the appropriate tasks, and all the frame's hardware has been reduced to the minimum possible size. After some frame failures at the head tube/top tube juncture a few years ago, AMP invested in a data acquisition computer and frame test jig. After testing virtually every frame made to gather baseline data, AMP designed the front of all its frames to increase strength immensely. The fruits of the frame testing are obvious with the adoption of motorcycle-style, head-tube gussetting.

AMP'S COMPONENTS ARE MORE IN-HOUSE THAN OUT

AMP Research doesn't make complete bikes—it leaves that up to its dealers—but more than any other custom builder, AMP takes total control of its design. AMP's



Construction zone: The B-4's interrupted-seat-tube section employs monocoque, CNC machining, formed tubing, bolting and TIG-welded construction—all within one square foot. Minor ride height adjustments can be made by shimming the AMP's shock above its clamped, seat stay crown.

AMP B-4 SPECIFICATIONS

Frame type: MacPherson strut, interrupted-seat-tube full suspension; TIG-welded CU92 front and rear section; 6061 T-6 alloy rear suspension; two water bottle mounts on down tube.

Suspension type: Full-active MacPherson strut.

Frame geometry: Size tested—17.5" (center-to-top); Top tube—23"; Wheelbase—43"; Chainstays—16.75"; Bottom bracket height—12.5"; Head angle—70°; Seat angle—72°.

Fork: AMP carbon F4-BLT; twin-shock, coil springs, oil damped.

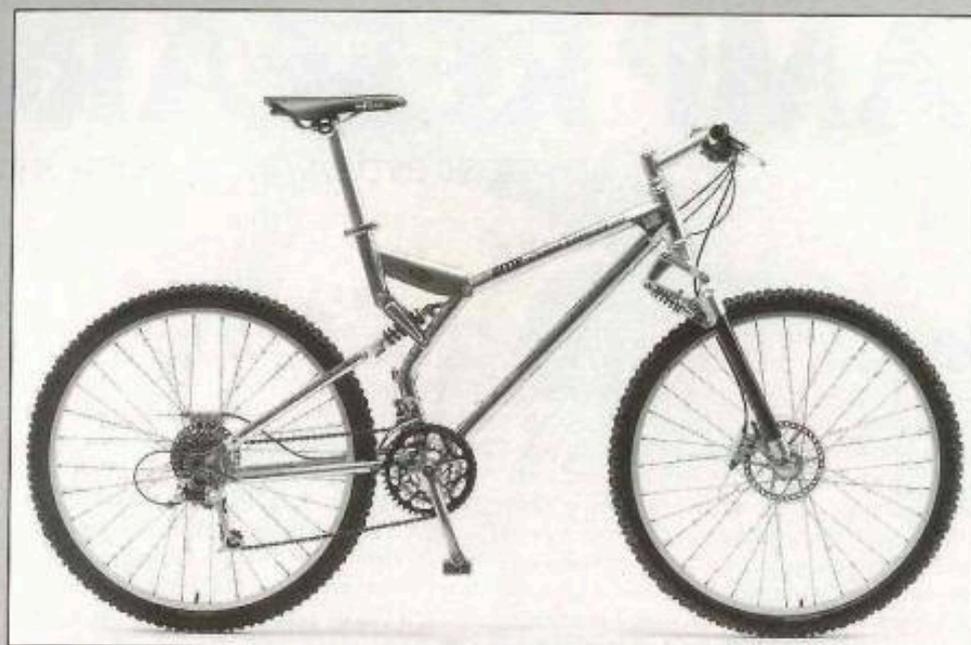
Shock: AMP through-shaft, steel spring/oil damped.

Suspension travel: Front—3"; Rear—2.75".

Weight: 24.5 lb.

Sizes available: S, M, L (two frame sizes combined with two different subsections can be mixed and matched to suit).

Components: (AMP does not sell complete bikes) Front derailleur—Shimano XTR; Rear derailleur—Shimano XTR; Shift controls—Shimano XTR shift/brake combo; Brakes—AMP D-1 hydraulic disk; Crankset—Shimano XTR (46/36/26); Hubs—Shimano XTR freehub, 32-hole (rear), AMP, 32-hole (front); Cogs—Shimano XTR 12 x 32—eight-speed; Wheels—Mavic 231 rims, 14-/15-gauge spokes w/brass nipples, Michelin prototype cross-country 2.1" front and rear tire;

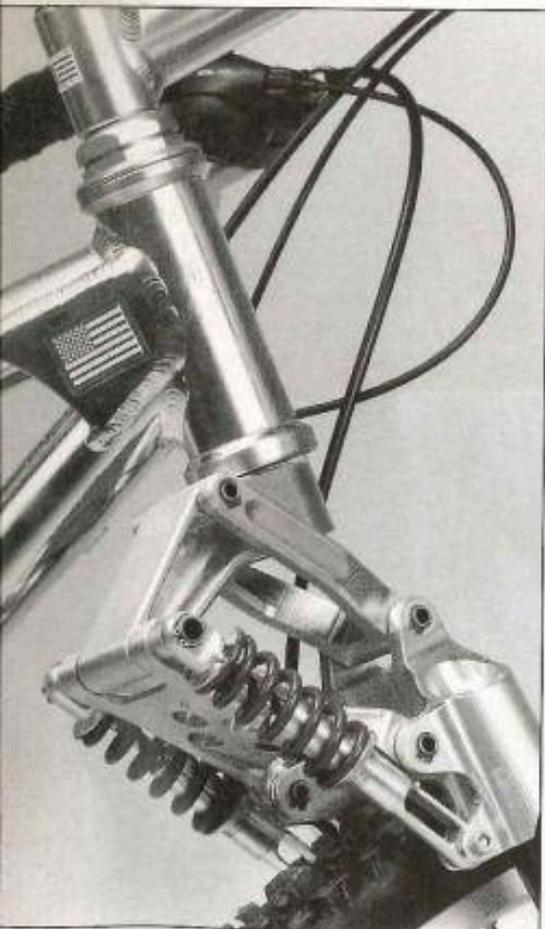


Stem—Control Tech threadless, 135mm extension, 10° rise, TIG-welded alloy; Saddle—Vetta SL chromoly-rail; Seatpost—Control Tech, alloy (31.6mm); Goodies—Three-down cable routing; spring-loaded brake housing; hollowed-out, CNC-machined junctions; Critical Racing/Easton,

alloy handlebar with 5° bend; Bontrager Ti-Tech alloy bar ends.

Price: \$1400 (frame only), \$1950 w/fork and \$2680 (frame fork and disc brakes).

Contact: AMP Research, 1855 Laguna Cyn. Rd. Laguna Beach, CA 92651. (714) 497-7525.



Unlikely duo: Only nature can compare to the AMP BLT fork's form-follows-function design principles. Twin shocks add redundancy to the fork to ensure its longevity. The plate gusset on the frame bolsters its diminutive head tube area.

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engineers don't buy the brakes, fork or shock—they build their own! The B-4 isn't available as a complete bicycle, but in full-frame kit form, the AMP comes with the frame (available in three sizes, plus two different seat towers), dual disc brakes (front and rear), front hub (plus rear disc adapter), linkage fork, CNC-machined seat clamp and thru-shaft shock. That is a substantial starter kit. After that, the AMP B-4 will accept nearly all standard components without a fuss (a rare suspension frame trait). Ours came equipped with a '95 Shimano XTR group; Mavic 231 rims; Control Tech seatpost and 135mm, ten-degree-rise stem; Critical Racing handlebars; and Titec bar ends. Our test B-4 rolled on prototype Michelin racing tires. With no milled or whittled-down fluff, our AMP B-4 weighed under 25 pounds ready to ride.

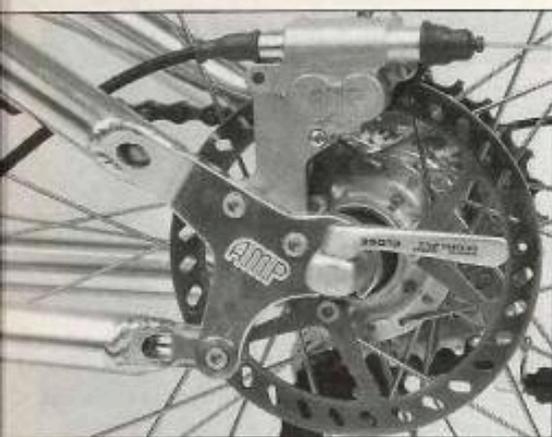
Up front, the AMP's three-inch-travel linkage fork follows the same design acumen—no organic styling here, just enough material to suspend the front end. In an unusual twist, Horst chose carbon fiber for the AMP's fork legs (Alcoa CU-92 fork legs are available at a lower price and slightly higher weight). However, in static and extended fatigue testing, the 1.125-inch-diameter, carbon composite tubes outperformed steel and aluminum by a magnitude of three. It is also the lightest

three-inch-travel fork made, at 2.6 pounds. That's feathery!

HOW THIS BIKE ADDED "ACTIVE" TO THE VOCABULARY

How good is the AMP B-4? Good question. First, though, let's talk about what's *not* good about it. Horst's penchant for simplicity is somewhat of a limiting factor in the damping department. There is no fancy valving in the AMP hydraulic shock, only a few microscopic holes in the piston and an O-ring that acts as a rolling valve. The benefit is that the tiny shocks can be rebuilt with a pair of pliers . . . in outer Mongolia . . . at night. The bad news is AMP owners will never enjoy the beauty of a subtle-feeling, speed-sensitive, valve-stack-equipped shock. Don't get us wrong, AMP damping is certainly good, but to anyone who has experienced a dialed-in Noleen shock, a ride on the AMP unit is like settling for frozen yogurt when you could have Haagen-Dazs.

That said, the B-4 was pretty well dialed in. The rear end was a bit harsh in compression, but we used all of its 1.5-inch stroke with a minimal amount of preload on the spring. Rebound was spot-on! There was never a feeling that the rear wheel was pushing the saddle into the rider over low-speed hits, and it didn't chatter over high-speed ripples, either. New for '96 models is a small piston tucked inside the shock shaft that exerts internal pressure on the shock fluid (like a mechanical version of a nitrogen-charged shock). This pressure keeps the seals pressed onto the damper shaft to prevent



Cable-operated CD player: There's no real weight penalty to justify the naysayers. Once you have had a chance to get acquainted with AMP's powerful disc stoppers, there is simply no substitute for the cable-actuated hydraulic unit—not amongst the cantilever crowd.

the shock from sucking air and developing AMPhysema. It works. Our B-4 ran silently throughout the evaluation.

The AMP F-4 BLT fork was a dream. One normally hard-to-please test rider claimed that AMP's three-inch-travel linkage fork was the absolute best mountain bike fork he has ever ridden. The pluses? (1) Because its two shocks were external, spring preload could be fussed with and verified easily. (2) The wide-spaced blades and crown had ample mud clearance (enhanced to the nth degree by the hub-mounted disc brake). (3) The oversized, carbon fiber legs were super-stiff. In the middle of a difficult turn, it was possible to bomb over impossible rocks without being forced off line. This level of lateral rigidity is not found in telescopic forks. (4) AMP's new linkage geometry is very supple on the bottom and follows a gradual, rising-rate curve as the fork moves through its stroke (original short-travel AMP forks were falling-rate units that worked best in the mid-stroke, but not too well at the extremes). (5) Under braking, the new fork doesn't dive excessively. It continues to soak up the terrain. Ours came with a stiff spring in one side and a soft unit in the other. There are three springs that can be mixed and matched to produce the full spectrum of spring rates. (6) Unlike most of the current crop of microcellular, long-travel, telescopic forks, the AMP F-4 BLT fork (a strange name) doesn't leave a descending rider with too little travel to work with by settling down into its travel on descent under load. (7) This is a great fork . . . if you can go with the flow of its linkage looks.

As expected from the father of active suspension, the B-4's rear suspension operates independently of braking and pedaling forces. While there continue to be naysayers of the value and efficiency of active rear suspension, these were the same people who wanted lockout on their forks four years ago. To many, active suspension is the greatest luxury currently

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offered on dirt. Simply concentrate on pedaling—and let the bike worry about the terrain.

DOES IT HANDLE LIKE A BIKE OR MOTOCROSSER?

The B-4 tends to be a quick handler—very motocross-like. Its front end feels nimble and steers lightly, even in tacky earth. This adroit sensation gives the rider the impression that the AMP won't be secure at speed. Once each test rider overcame his hesitancy and turned up the wick, the B-4 revealed another secret—its longish 43-inch wheelbase and laid-back angles keep the bike tracking true at almost any speed. How so? The fork's two-inch offset reduces the front end's trail and makes the bike steer lightly. This setup aids the AMP's ability to track in deep sand. The best technique for guiding the B-4 is to overbank the bike (by bending at the waist) in the slow stuff and weight the outside pedal in the fast corners. Quibbles? Yes. The midsized B-4s have a 72-degree seat angle, which for this setup is too slack to keep the rider's weight centered over the bike. We would recommend sliding the saddle a half-inch forward to squeeze max performance from the B-4's handling department (smaller riders could look into the steeper bolt-on seat tower).

Climbing was a no-brainer. Ample traction was always on hand, even in the slickest terrain. There was no mush sensation from the suspension when cranking out of the saddle. Don't get us wrong, this is not a hardtail. All active bikes sag under power—it's simply no big deal. The bike's laid-back seat angle impeded the transition from seated to out-of-the-saddle cycling by a slight but noticeable amount. The same position, however, makes the B-4 a comfortable descender. The saddle falls in a natural position for descending long singletracks. When standing, the saddle rests naturally between the rider's legs, aiding control, and the weight bias when seated is just right for cornering and hard braking.

And what about those disc brakes? Awesome! The best there ever was! There is no weight penalty on the AMP disc when compared to cantilever brakes. We have even ridden more powerful AMP brakes, but AMP switched to softer, organic brake pads (from semi-metallics) to eliminate some squealing at the expense of ultimate braking power. It was a good trade-off. Because the brake calipers are cable actuated, the B-4 can use Shimano's RapidFire shift/brake levers (RapidFire lovers are banished to twist shifters with most hydraulic disc brakes). As AMP warned, test riders unaccustomed to the powerful stoppers were all over the trail initially as they washed out their front



Plastic-fest: Large-diameter composite fork legs for fatigue strength and a polycarbonate shield to shed the muck off the AMP's disc brake rotor are the two places where the B-4 shuns aluminum in favor of plastics. The fork weighs less than 3 lb.—wet.

wheels and skidded sideways from over-braking. Once they tamed their ham-fisted cantilever braking technique, they went faster with less fear. Truly, anyone who has used a good set of disc brakes on the dirt won't be satisfied with those cute little aluminum-clad, pencil-eraser friction devices we used to call brakes ever again. Descending long singletrack was so comfortable and controllable with the AMP discs, even our resident retro-techno-groucho (the Felix Unger of the off-road) was silenced.

THAT FOR WHICH WE GIVE HUGS & KISSES . . .

Above all, the AMP B-4's main advantage is weight—or, rather, the lack of it. A B-4 frame, including its shock, weighs less than five pounds. That's about a pound less than almost every other suspension bike available. Horst Leitner is a weight freak to the degree of roadie-ism. The B-4's much-discussed active suspension, combined with AMP's exemplary, long-travel linkage fork, is a real treat. Add the AMP D-1 disc brakes to the mix and you have a real plum. All the B-4's rider does is pedal the bike, looking for difficult obstacles to pop up—the bike's mission is to seek and destroy trail trouble. The suspension levels the trail and keeps the tires hooked up, the brakes never fade and always remain in adjustment, and the B-4 handles well enough to allow its pilot to focus on the terrain, not the bike.

On the technical side, the AMP can be maintained with simple tools, and its dropped, top-tube frame will accommodate most any rider. AMP spent a lot of

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time in the last year successfully stiffening the chassis (thanks to CNC-machined crowns at every juncture, integrated seat stays, stout main triangle and improved pivot pins). The payoff is that all the pivot points (17 of them) are now easily serviceable, inexpensive items. You can't beat a ball-burnished, bare alloy frame for a low-maintenance finish. In short, the best part about the new B-4 is its low-hassle/high-enjoyment factor.

THAT FOR WHICH WE STRIKE YOU ABOUT THE HEAD . . .

Horst's design philosophy accentuates lightweight, active suspension and creative engineering, but he is not, and has never been, from the school of thought that worships rigidity. While the AMP B-4 is by far the most torsionally rigid AMP ever, hammerheads will notice frame flex both under power and when carving through rough corners. Most of this flex seems to be a direct result of the B-4's tiny, weight-saving, rear shock shaft deflecting under peak loads. The rest probably stems from the combination of Horst's philosophical tilt and his passion for shaving off the last measure of unwanted material.

While Felix-followers will rave about the B-4's minimal weight, the lord of all retentives could never come to terms with the AMP disc brake's ever-so-slight contact between its rotor and pads. While the minuscule amount of friction could not be measured by mortal legs, Felix *knew* that the phantom disc-drag was inflicting severe punishment on his pedaling prowess.

WHAT WE REALLY THINK OF THE AMP B-4

When you see a full-suspension bike, you automatically think "downhill." Not so with AMP. It builds cross-country bicycles. The B-4 is a top-performing, light-enough-for-Pro-racing, cross-country screamer. If you are a progressive-thinking, full-suspension kind of guy, there is compelling evidence that the B-4 is the bike for you. If you are the type who worries about spending your hard-earned cash on expensive technology that will become obsolete in an hour, you won't have to worry about the B-4—this bike is way ahead of its time. If you don't like to answer tech questions while training with your buddies, however, the B-4 may not be a good idea.

MBA test riders rated the B-4 a solid 9.5 on a scale of ten. We are well aware of its flaws, but to tell the truth, its positives so greatly overshadow its negatives that this bike is almost invincible. One big *caveat*: if you are a muscular, thrashin' kind of six-packin' downhill guy still weeping about the demise of the rigid bike, the B-4 is not for you. We wouldn't even want you to own one. □