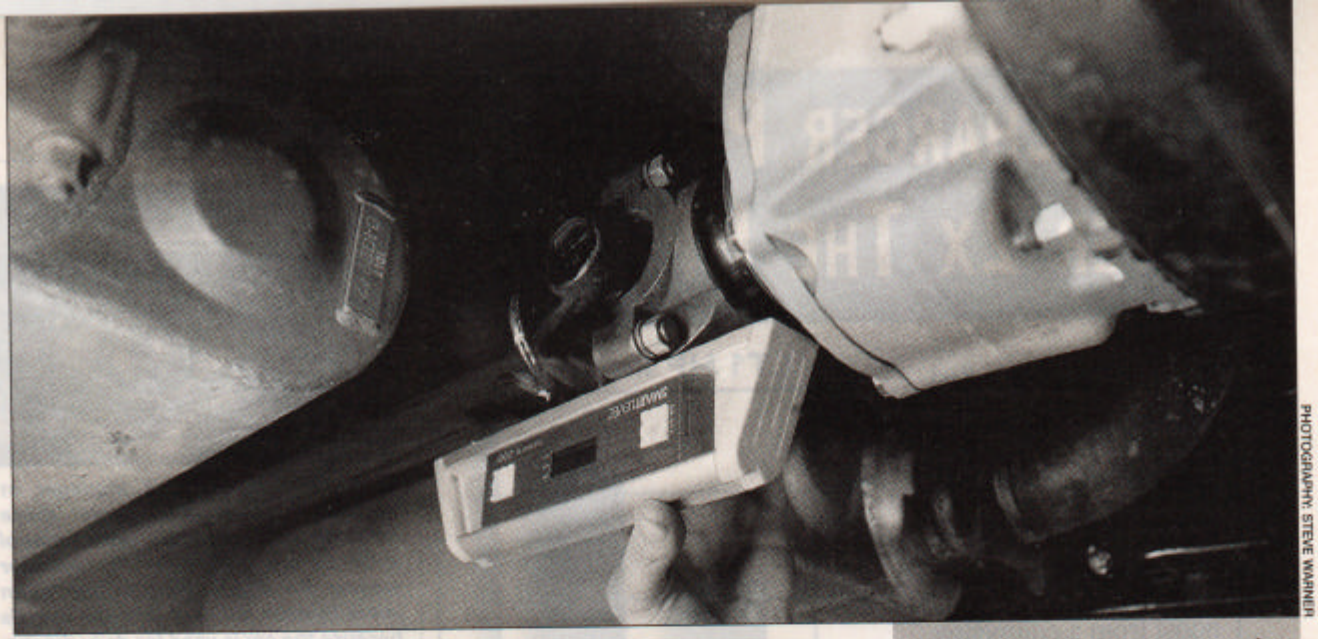


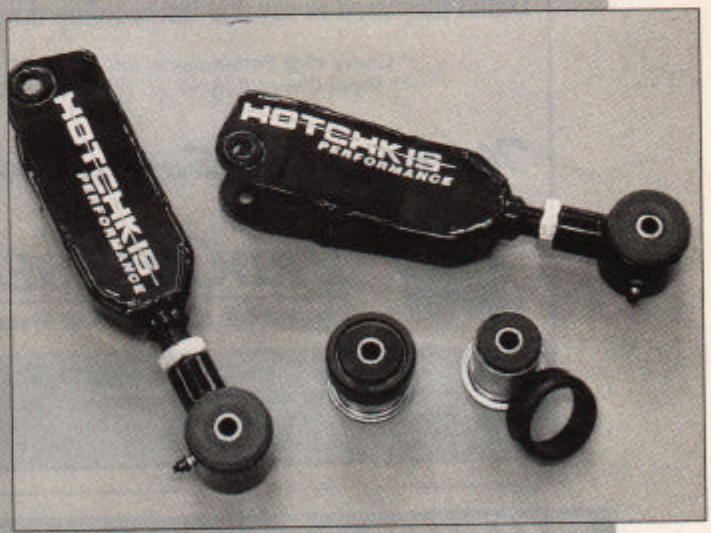
PHOTOGRAPHY: STEVE WARNER

In order to measure the correct pinion angle once the new Hotchkis adjustable upper control arms are in place, some sort of inclinometer is needed. Several measurements were taken to determine the correct driveline angle, ensuring the vehicle will not suffer from vibration associated with a bad pinion angle.

The Big, Beefy Arm

New Hotchkis Upper Control Arms

By Steve Warner

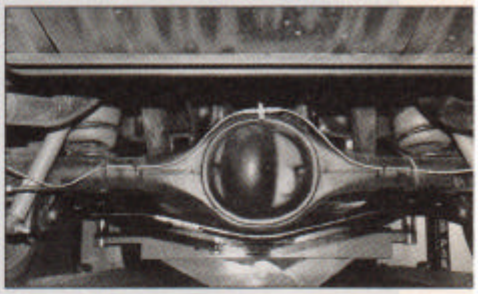


The Hotchkis adjustable upper control arms are designed to fit all '64-'72 A-body Chevelles, Malibus, and El Caminos and '78-'88 G-body Monte Carlos, El Caminos, Buick Grand Nationals, and Pontiac Grand Prix. Made from 1018 steel, the CNC-machined components are TIG-welded and feature durable, greasable polyurethane bushings for longevity and a quiet ride. Originally designed to adjust the pinion angle on aftermarket rearends to eliminate driveline vibration associated with incorrectly placed pickup points on the centersection, these arms can also be adapted to make the car launch harder at the dragstrip.

Building horsepower into any musclecar requires the same attention to the suspension as under the hood. You can't add a gigacube big-block without adding monster-large brakes if you ever expect to stop the car. The same principle holds true for the chassis and suspension. One swap that seems to happen more regularly is the removal of a stock 10- or 12-bolt rearend and the upgrade to a more stout Ford 9-inch or a beefy 12-bolt. Several companies offer rearend swaps, and most are said to be an easy bolt-in. However, this often isn't the case. The upper control-arm pickup points are sometimes not welded to the rearend housing in the optimum place, which results in a bad pinion angle or the binding of the upper control arms.

Such was the case with Scott Gillman at Hotchkis Performance. The thumper portion of his '64 wagon was a megacube GM Performance Parts 502 big-block and a beefier 9-inch using Hotchkis suspension parts. The wagon seemed ready to go, but on the first high-speed test-drive, a vibration was noticed beginning at 70 mph. Closer inspection revealed a bad pinion angle. Being the creative suspension innovator, Hotchkis developed a unique, adjustable upper control arm for all '64-'72 A-body and '78-'88 G-body cars to rectify the problem. This adjustability means you must

THE BIG, BEEFY ARM



Scott Gillman, product manager at Hotchkis Performance, runs these Hotchkis fully adjustable upper control arms on his big-block '64 two-door wagon. He didn't want to run Heim joints to mate the 9-inch to the chassis because the car is used for daily driving. The spherical-bearing Heim joints minimize movement of the rearend housing, which is great for all-out drag racing but doesn't translate well for a daily driven car. When Gillman installed the new rearend under the wagon, he found out the upper pickup points did not produce a proper pinion angle, so Hotchkis developed these adjustable arms.

Installing the arms is basically a remove-and-replace procedure. You need to unload the rear suspension as much as possible. This means disconnecting the shock absorbers, removing the rear springs and rear sway bar (if the car is equipped as such), and unbolting the upper control arm from the top of the rearend housing.

set the proper pinion angle.

The Hotchkis fully adjustable control arm is CNC-machined and 100 percent TIG-welded, which results in a much stronger arm than the factory piece. The adjustability allows for pinion-angle changes. This serves numerous purposes: For drag racing, it allows you to adjust the pinion

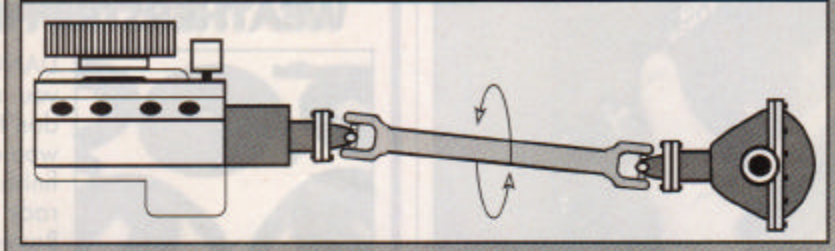
Once both stock upper control arms are removed, the new Hotchkis arms need to be adjusted for a preliminary fit. On the bench, determine the center-to-center length of the factory upper control arm with a tape measure. Then transfer the measurement to the Hotchkis arm and add roughly ⅛ inch for fine-tuning purposes. Reinstall the shock absorbers and rear springs. Before fitting the Hotchkis arm on the rearend, install the bushing end of the adjustable arm into the upper pickup point on the frame and replace the bolt without tightening it.

One full turn of adjustment is equal to a ½-degree change in pinion angle. If necessary, a half-turn of the front bushed portion of the arm will produce ¼-degree changes.

angle in your A-body to get a better bite from the rearend, resulting in harder launches and hopefully lower e.t.'s. Another advantage of an adjustable upper control arm is when you add tall slicks to the rearend or airbags inside the coil spring. When this happens, the pinion angle can shift, which in severe cases can cause driveline vibration. For Pro Touring or show cars featuring a hammered road stance, the adjustable arms are the perfect solution for a driveline with too much positive (or down) pinion angle. The correct pinion angle will

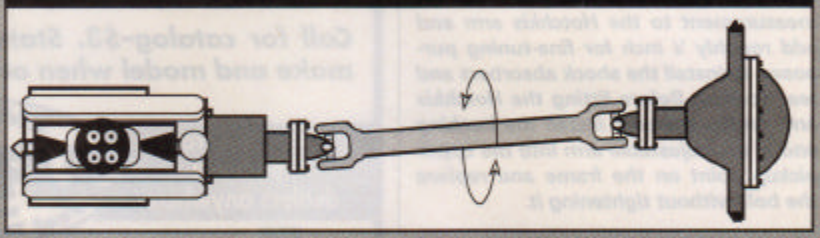
THE BIG, BEEFY ARM

OPTIMUM PINION ANGLE



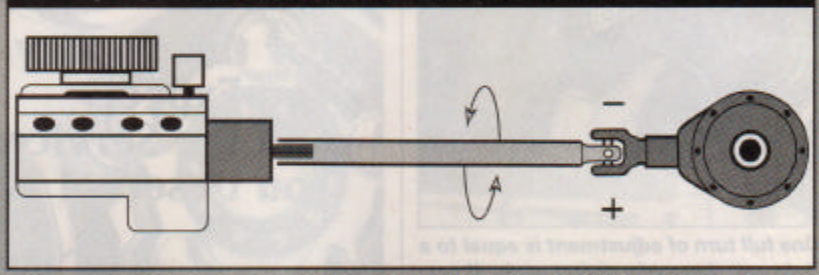
Although this illustration exaggerates the optimum pinion angle for the rearend, if your drive-shaft is at this angle, you will have a severe vibration that can result in U-joint failure. The Hotchkis adjustable upper control arms can help return the pinion to the correct angle when installed properly.

OPERATING ANGLES IN TOP VIEW



As this top-view illustration shows, the engine is rarely directly inline with the transmission and rearend. If it's all lined up, the needle bearings in the U-joint won't move and all the wear would be concentrated in one area on the needle bearings. This isn't what you want. There needs to be a slight amount of mis-alignment to allow the U-joints to function properly.

ONE-PIECE DRIVESHAFT



There is an SAE manual over 500 pages long that describes the points from which to measure and set the correct pinion angle when using Hotchkis adjustable upper control arms. This illustration gives the positive and negative approaches to setting pinion angle. Looking at the transmission and rearend centersection from the driver's side, when the pinion points up, it's in a negative direction. When the pinion aims down, it's in a positive direction.

ILLUSTRATIONS: MARK G. BAUGH

After each turn of the Hotchkis arm, reinstall the piece and check it with the inclinometer. No matter how many times you check and double-check it, the odds are it will read slightly different. You will probably have to average the numbers you achieve to get the desired results.

THE BIG, BEEFY ARM

Our friends at Angle Pro provided us with the information on how to reset the correct pinion angle: Place the car on blocks to gain access to the underside with the car at ride height to get accurate readings. Looking at the pinion from the driver side, it rarely is perfectly level. The pinion is usually tilted in a downward direction. Therefore, the driveshaft angle needs to point upward (negative or closer to the floorpan) at 3 degrees. Using the inclinometer, establish the 3-degree upward pinion angle by rotating both Hotchkis adjustable control arms in or out until the desired angle is achieved. Because of the denser polyurethane bushings, the rearend shouldn't wrap up very far. If the car is used solely for drag racing, you may want to experiment with a greater downward pinion angle to improve the launch. Remember, if the car develops a driveline vibration, the angle is probably set too low. An accepted rule is that there can be up to a 3-degree variation—up or down—in pinion angle from the point of original measurement and the actual pinion angle itself.

produce a vibrationless ride and promote increased U-joint life.

Setting the correct pinion angle should be left up to a competent driveline shop, but the do-it-yourselfer can attempt it at home with the proper tools. It requires an inclinometer, such as a digital angle-finder similar to this Smart Level from Smart Products, or a bubble protractor. The theory is this: You want to have the pinion angle almost parallel to the engine angle, which varies from car to car. The pinion angle that might work on your buddy's '64 Chevelle, which is equipped similarly to yours, might not necessarily be the same pinion angle in your car. The basic rule is that if the car experiences a driveline vibration, the angle is usually excessive. Imagine looking at the car from the driver's side. The ideal rearend pinion angle at the driveshaft

The correct pinion angle should basically be parallel to the angle of the crankshaft with the car at normal ride height. Using the Smart Level angle finder on the engine's front pulley, 3 degrees down was the determined measurement.

yoke will point slightly upward (or negative). This will create a parallel angle to the downward (or positive) angle of the driveshaft. The preferred place to measure the engine angle is the vertical end of the extension housing on the transmission where the seal is. To do this, the driveshaft will have to be removed.

When power is transferred to the rearend and it starts to wrap up, you want to limit that upward (or negative) angle to no more than the measured angle, whether it be the crankshaft or the transmission extension housing. This is where the inclinometer tool comes into play. It will help you determine the angle of the crankshaft so you can set the correct rearend pinion angle at the driveshaft yoke. **CHP**

SOURCES

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