## This simple, rugged differential gave solid-axle Corvettes extra traction

Dana Powr-Lok

By Mike McNessor from September 2021 issue of Hemmings Motor News



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Solid-axle Corvettes from 1955-'62—as well as 1955-'64 full-size Chevrolets—equipped with Positraction put the power to the ground via the Dana Powr-Lok differential (sometimes referred to as the Thornton Powr-Lok, after its inventor, Ray F. Thornton). These units were used by GM, Chrysler, Studebaker-Packard, and Willys Jeep, as well as other automakers. It's a rugged differential, ingeniously simple, and parts are still available today—as are new and rebuilt units.

Inside the Powr-Lok used in 1960-and-newer Chevrolets, there are two short stacks of clutch discs and plates a set of five on each side, for each axle. Very early Powr-Lok designs used cone clutches, but they were prone to chattering, while 1955-'59 Chevrolets used four plates per side. At the center of the differential is a cross shaft with four gears—one gear slipped over each end of the cross. Those gears engage with side gears that are aligned with the clutch plates and discs. On the differential case, there are ramps that cradle the ends of the cross shafts. When a load is applied to the differential, the force causes the cross shafts to climb the ramps in the housing, which then loads the clutches and transfers power between the axles. It's possible to make the Powr-Lok's locking action more or less aggressive by varying the number and arrangement of the plates and discs. There are also dished Bellville plates and discs, which preload the clutches, making engagement more aggressive when installed in different configurations, depending on the application. Recently we disassembled one of these units pulled from a 1964 Chevrolet car, installed new plates and discs, and then reassembled it. The process was easy, though finding some of the correct replacement parts took a little hunting.



We started by removing the differential bearings. The job was made easier with this rented puller.



ring With the gear removed. we then removed the bolts holding the case together. These are *left-hand threads,* SO be sure your impact wrench is set accordingly.



You'll need to mark the two halves of the case to ensure they're reassembled correctly. We put in two small dimples with a prick punch then highlighted them in crayon.



With the case split in two, some wear on the cross shafts and gears was evident, but they would be cleaned and reused



The clutch plates and discs (plate pictured) were scored, worn, and due for retirement



A little hunting on the internet turned up this NOS clutch and disc kit that had the correct plates and discs. Ours required two thin plates (.060inches) and four thick plates (.090-inches), plus four discs. Two of the four plates were dished Bellville plates and two of the four discs were dished Bellville discs. discontinued The number for the Spicer kit that we purchased (1960-'64 *Corvette/Chevrolet* car) was 22719X.



The dished Belleville plates and discs (disc shown) preload the clutch pack for positive engagement.



Beginning with the thinnest plate, the four remaining discs and plates were lubricated with *limited-slip* additive and stacked in the order they were removed. The dished plates and discs were installed with the inside diameter in contact with the disc or plate they were stacked on. In other words, with the convex portion toward the outside of the case. This was repeated on the other half.

With the cross shafts and gears installed, we lined up the marks and put the two halves back together.





New ARP bolts were used in place of the original 50plus-year-old fasteners.



Before torquing the bolts, an axle shaft was used to align the splines inside the differential.



The final step was to torque the bolts to 40 foot pounds.



**HILLS**—On hills where road conditions are poor, Positraction keeps wheels from uncontrolled spinning if either should bounce off the road.

BETTER CORNERING – Inside rear wheel won't spin if it lifts during hard cornering—and there's better control in rear end break-away and oversteer conditions.



OFF PAVEMENT-If the outside rear wheel drops off the road, the Positraction rear axle helps maintain safe, sure control. Traction stays with the wheel on the firm road surface. This is especially useful in specialized sport car meets.



SNOW, MUD, ICE-Snow, mud and ice problems are minimized with Positraction. Safe, sure, controlled starts are easier on slippery surfaces. Driving and stopping are surer, too.



ICY HILLS—Even if the road is completely covered with ice, Positraction keeps wheels turning together, doesn't allow one wheel to lose traction and spin freely.



OIL ON THE COURSE! In specialized sports car meets, Corvette's Positraction maintains traction and control over oil, water, or loose dirt on the course. Cornering is secure, positive and controlled.

Provided by GM



1955-'64 In Corvette Positraction rear axles. engine power is transferred from the ring gear to the differential case (A). Driving force then moves the cross pins (B) up the ramps of cam surfaces (C), applying multiple disc clutches (D). This, in effect, locks the axle shafts in a normal, straightahead position. The division of torque between the axle shafts varies according to the traction at each rear wheel, allowing the wheel with the most traction to get the greatest driving force. When cornering, the faster outside turning wheel relieves the load on the clutch discs (D) so that the unit operates like α conventional differential. Only when one wheel loses traction will power transfer to the wheel with traction.