

# Searching for C4 chassis stiffness

TEXT AND PHOTOS BY DICK MORITZ

It seems as if chassis flex was designed into C4 Corvettes on the assembly line. While they were great cars when they were built (and still are), two decades of chassis engineering have shown that increased stiffness in the Corvette's underpinnings can dramatically improve handling with little adverse effect on ride characteristics.

Does that mean you need to learn to live with the "flexy" nature of your C4? We posed that question to the helpful folks at Mid America Motorworks to see if they had a map to the hidden gold we're looking for. Turns out there's buried treasure in Mid America's catalog: an anti-flex cross frame. Engineered by the talented folks at R-D Racing, this beefy cross frame was devised to limit frame flexing and make the car's chassis more rigid. It's designed to fit snugly just below the underbody, so it only reduces ground clearance by an inch.

The Mid America representative told us we'd feel a substantial reduction in chassis flex and that the installation was straightforward. We decided to install one of these cross frames on an '87 coupe to see how

tough it would be and to determine how much difference we'd feel in the car's handling. Only two part numbers cover all C4s: one for '84-'85 and another for '86-'96.

The installation, as well as the instructions provided with the kit, is straightforward. There were a few pleasant surprises and no unpleasant ones. One concern that merits careful thought is raising and supporting the car for this installation.

We used a lift in a friend's garage in order to facilitate photography, and even at that it took nearly an hour to get the car properly positioned. It's easy to obstruct the attachment points for the cross frame, and you have to maintain access to the entire underside of the cockpit—not an easy task, especially if you don't have access to a twin-post lift.

In the absence of a hoist, we think the best way to support the car for this job would be with two pairs of drive-on ramps. And rather than driving onto the ramps, we suggest jacking up the car and placing the ramps with the angled ramps facing the end of the car rather than the center. This way, the car will be supported safely by the wheels, and

## DIFFICULTY INDEX

ANYONE'S PROJECT  
No tools required

BEGINNER  
Basic Tools

EXPERIENCED  
Special Tools

ACCOMPLISHED  
Special tools and outside help

PROFESSIONALS ONLY  
Send this work out

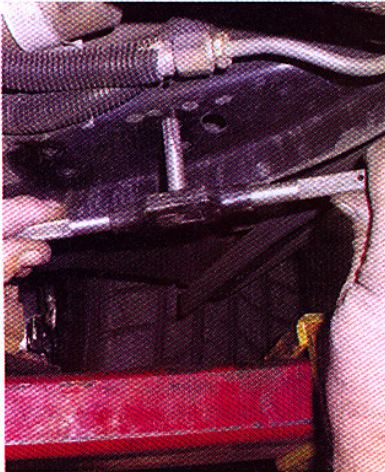
the angled ramps won't be in the way during the installation. The only requirement for height is the room needed to get a drill under the car. Mid America offers some nice ramps for about \$40 a pair, and picking up two pairs would be a good idea—not just for this job, but for future oil changes and other undercar work.

With the car properly supported, the installation went easily, and the instructions were well thought-out. It's definitely a two-person job, and the only unusual tool we needed was a  $\frac{1}{2}$ -inch drill bit for installation of the thread inserts. Yes, you really do need one. No, you can't just use a half-inch

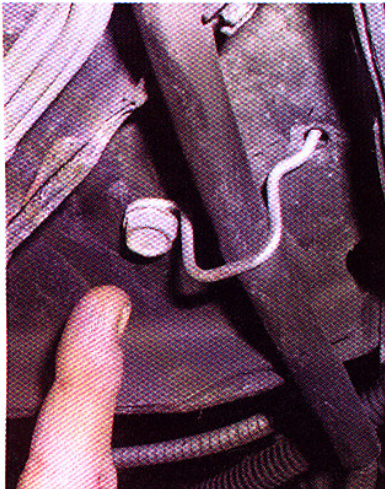
## PARTS LIST

(From Mid America Motorworks catalog)

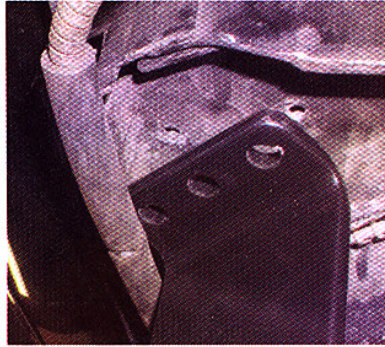
- Anti-Flex Cross Frame, PN 612-644
- Camber Brace, PN 612-225
- Ramps (two pairs), PN 113-037



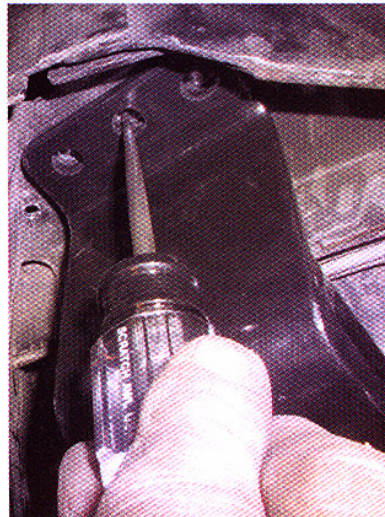
The front end of each member mounts to existing holes in the frame using bolts supplied in the kit. Install the right-front-to-left-rear brace first. The right front is cleverly labeled "RF." We used a  $\frac{1}{8}$ " 16 tap to clean the threads for smooth, positive engagement of the bolts.



At the driver-side rear, there's an existing bracket for the parking-brake cable that must be removed to position the brace in the rear. We'll reinstall this bracket later.



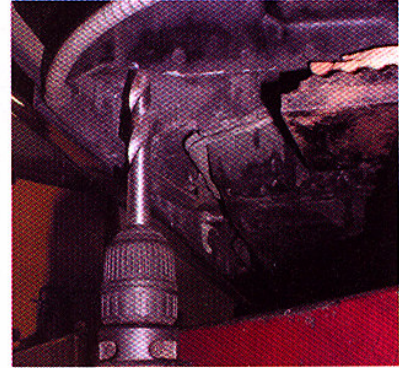
With the bracket removed, we can place the first brace into position. The instructions are clear: You must first install the brace that goes from right front to left rear.



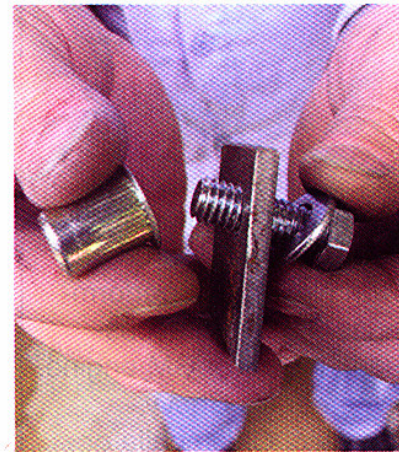
Carefully scribe a mark to drill the first hole. A  $\frac{1}{8}$ "-inch drill bit (yes, we really had a 13/32-inch in our drill index) fits perfectly into the holes in the brace, so this pilot hole was self-centering.



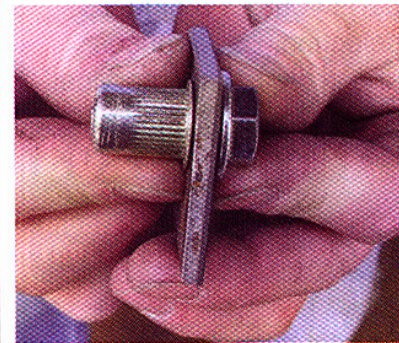
The scribe mark for the center hole can be seen clearly, along with the existing holes in the chassis.



It's important that these holes be located precisely since they'll define the position of the threaded inserts that will hold the brace in place.



Our cross frame came with slick Nutserts that draw into place like rivets. A simple steel plate keeps the Nutsert from turning while the bolt is tightened, as do the splines on the insert.



The assembled threaded insert is placed into the  $\frac{1}{8}$ "-inch hole and, as the bolt is tightened, the steel plate jams into the adjacent frame, preventing it and the insert from turning. While it feels like you're stripping a bolt, it gets tight, then loose (as it starts to compress the insert), then tight again as it pulls up to its final installed position.

bit and hog out the hole a little bit. And yes, it's a little tough to find one (Home Depot online—not in stores, Sears Hardware, or the local NAPA store). You can't count on finding one the day you decide to do the job. Having a 90-degree-angle drive for your drill will make things easier.

We had an uneventful installation and a substantial reduction in chassis flex based on several weekends of fairly hard driving. We'll head to the dragstrip in a couple of weeks, and we're anxious to see if the whole body

of the car (not just the front) raises slightly during launch, which would indicate the wheels are more firmly planted to the ground.

## But Wait, There's More

Sure, our Mid America cross brace is a nifty product and it made a noticeable difference in chassis stiffness. But, what about the inherent weakness in the front crossmember on these cars? After all, a "U" certainly isn't the strongest configuration in the engineering world, and that's the shape of

the main front-end support structure on C4 Corvettes.

In our dialogue with the Mid America tech support staff, they suggested supplementing the chassis cross frame with its camber brace, which spans the front crossmember uprights and "boxes in the U" (sound like a line from Tony Soprano?). Also a derivative of R-D Racing's competition efforts, this camber brace fits all C4s ('84-'96) and takes the wobble out of the front control-arm mounting horns, so front-end geometry is maintained,



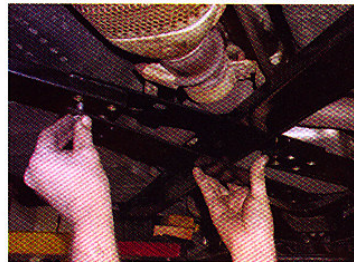
*It's best to drill these holes and install the Nutserts one at a time, since there's a possibility the Nutserts will pull slightly off-center as they compress.*



*After installing all three threaded inserts, we found we could attach the parking-brake bracket by drilling an additional hole, bending the bracket slightly, and attaching it using a flat washer.*



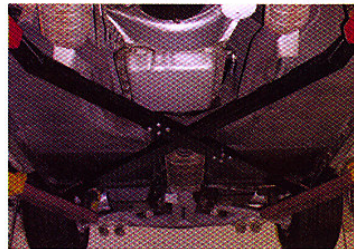
*With the right-front-to-left-rear brace installed, we could lift the other half of the frame into place.*



*The same threaded inserts we installed into the underbody were factory-installed into the cross frame to attach the bridge plate. The supplied Allen bolts have rounded heads, so, unlike regular hex-head bolts, they won't catch on any obstacles in the road.*



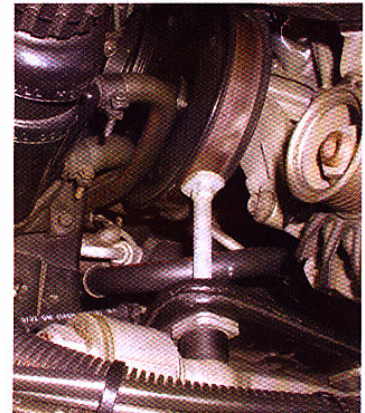
*The cross frame is nicely made, with recesses to clear the exhaust system. As a result, we found the finished installation to be rattle-free.*



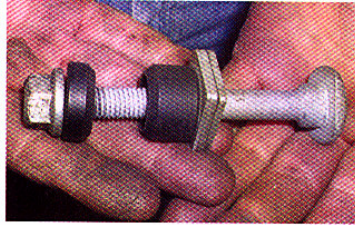
*Viewed from front to rear, the finished installation is clean, and provides a 1-inch reduction in ground clearance.*



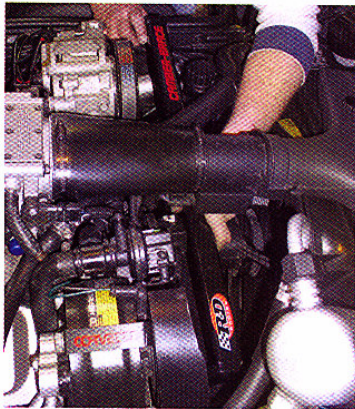
*The camber brace from Mid-America Motorworks is a hefty, nicely made piece that provides rigidity to the front crossmember to prevent sag and degradation of alignment characteristics. Our installation was on an '87 Vette. Other years may vary.*



*To install this camber-brace, you must support your car by the chassis instead of the wheels to allow the suspension to hang free. You must also remove the spring-loaded belt tensioner and serpentine belt, and loosen and raise the air-conditioning dryer. The camber brace attaches to the front bolts for the upper control arm, so you'll need to remove the existing front bolts that will be replaced with the longer bolts supplied in the kit. It appears the front bolt on the driver side might interfere with the power-steering pulley, but we found we could gain enough clearance after loosening, but not removing, the rear bolt holding the upper control arm in place.*



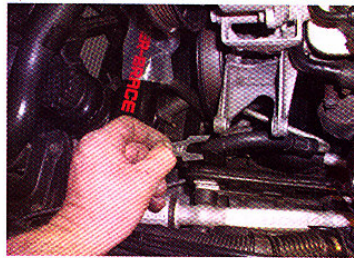
The front bolt assembly looks like this. The thicker bushing is toward the inboard side of the car. The bushing arrangement at the rear may not be the same. Make a drawing before disassembly so you know how these bolt assemblies go back together, and mark any front-end alignment shims as well so you can reinstall them in their original positions.



With both left and right front control-arm bolts removed, you can move the camber brace into position from the driver side. You may want to leave the plastic wrapping in place, or otherwise protect the bar during installation in order to protect the beautiful factory finish.



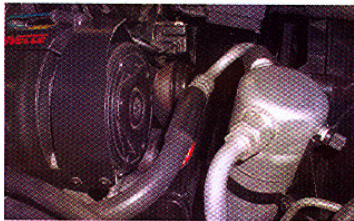
With the camber brace in position, you can install the longer bolts supplied with the kit, being careful to reinstall the bushings and alignment shims in their original positions. The driver-side control-arm bolt is a tighter fit than the passenger side due to the power-steering pulley, so it's easier to install the driver side first, then the passenger-side bolt, and torque according to factory specs.



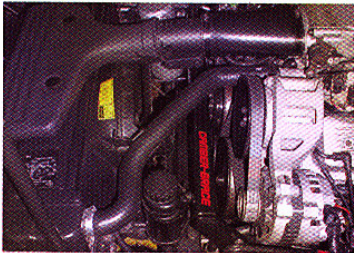
Our camber brace kit came with shims that can be selected to make up for any sag or distortion that may exist in your front end. We found that only one shim was needed for a nice, snug fit.



Here's a view of the installed bar with the control-arm bolt assemblies back in place. The next step is to reinstall the tensioner and serpentine belt.



The instructions suggest you may have to raise the A/C dryer as much as an inch for clearance above the camber brace. We found that just half an inch was needed. The instructions also suggest loosening the A/C line a quarter turn to allow slight repositioning of the dryer. This is an O-ring fitting, so loosening it slightly will not allow any loss of refrigerant. Be sure to retighten the bracket bolt. While it isn't noted in the instructions, check for any possible interference between the camber brace and power-steering hoses.



The finished installation is sanitary and looks almost factory.

## TOOLS OF THE TRADE

Here's what you need to install the cross frame:

- 1/2-inch drill bit
- 90-degree drill adapter would be helpful due to low ground clearance
- 3/4-inch socket
- 1/2-inch Allen wrench or hex socket
- Punch and hammer, or 3/8-inch drill bit
- 3/16 tap

For the camber-brace you'll need:

- Half-inch breaker bar for belt tensioner
- 15mm combination wrench for belt tensioner
- 13mm socket and combination wrench for control-arm bolts
- 10mm socket for A/C dryer bracket bolt
- Large adjustable wrench for A/C line fitting

even during hard cornering.

So we ordered a camber-brace as well, and it turned out to be as nicely engineered and easy to install as the cross frame. There isn't much excess space under the hood, but it's adequate and exactly as described in the instructions.

Did the camber brace improve handling even more? Too early to tell. Hopefully, a few laps around an autocross course will tell the tale. But, regardless of the immediate effects, this camber brace promises longer-term benefits. Given the notoriety of front crossmember sag in C2 and C3 Corvettes, there's no question this camber brace is at least cheap insurance against future degradation of your C4's alignment-sustaining capabilities. Intuitively, we have to believe that more predictable and constant tire-to-road contact will yield consistently better handling. **CF**

## SOURCE

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