g-Bar and g-Link Misinformation

There is a significant amount of misinformation on the internet regarding the Chassisworks g-Bar and g-Link rear suspension system for 67-69 Camaro. We have prepared this document to assist our customers with the arduous task of sorting the facts from the personal opinions, which abound on the internet. The misinformation falls into two categories:

- Failure of the front upper-control arm frame rail attachment
- My car will not sit as low as I would like

Failure of the front upper-control arm mount at the frame intersection

It appears that there are primarily two Camaros involved in these threads. One with a Chassisworks 2nd generation g-Link, the other with a Chassisworks 1st generation g-Bar.

Chassisworks Second Generation g-Link

Image-1 has been posted which shows a g-Link front upper control arm mount that is attached to a torn passenger side frame rail. There has been a significant amount of conjecture about why this happened. The answer is actually quite simple. Before I explain I would like to sincerely thank this particular builder for providing me with the following additional images that makes the issue much clearer. There are three significant problems with this particular installation.

1. The builder added an improperly welded threaded bung to the frame rail which is where the frame tear originated. Image-2, from the driver's side, shows that the threaded bung is clearly not welded completely around. This created a weak point in the side of the frame rail where the crack began.
2. The top of the upper control arm bracket is not only improperly welded to the Camaro floor structure; it is NOT welded at all. Image-2 If you look at the radiused corner of the frame mount by the bend in the brake line, the upper-control arm mount top surface is clearly not welded to the chassis as stated in the instructions. There is an extremely significant additional feature about the Camaro unit-body chassis visible. You can see that there are multiple layers of frame, floor and crossmember panels, all of which come together at the junction with Chassisworks' frame adapter. An extremely strong hard point in the Camaro chassis is formed where all these items intersect. The multi panel OEM unit-body was designed to support a significant load in this area. A properly welded frame bracket would have tied all these pieces together making the upper control arm frame connection infinitely stronger. Actually welding the connection properly to the floor and frame makes the installation stronger than styles with a tube crossmember. A detailed explanation is provided later in this document.


IMAGE-2

Housing Mounted Anti-Roll Bar (P/N: 5806-F10)
Our billet-arm, housing mounted anti-roll bar avoids the need to sleeve the frame rail by mounting the endlink with a folded clevis that welds directly against the frame bracket. All loads from the endlink are placed upon the much stouter frame bracket instead of the thin-walled factory frame rail.

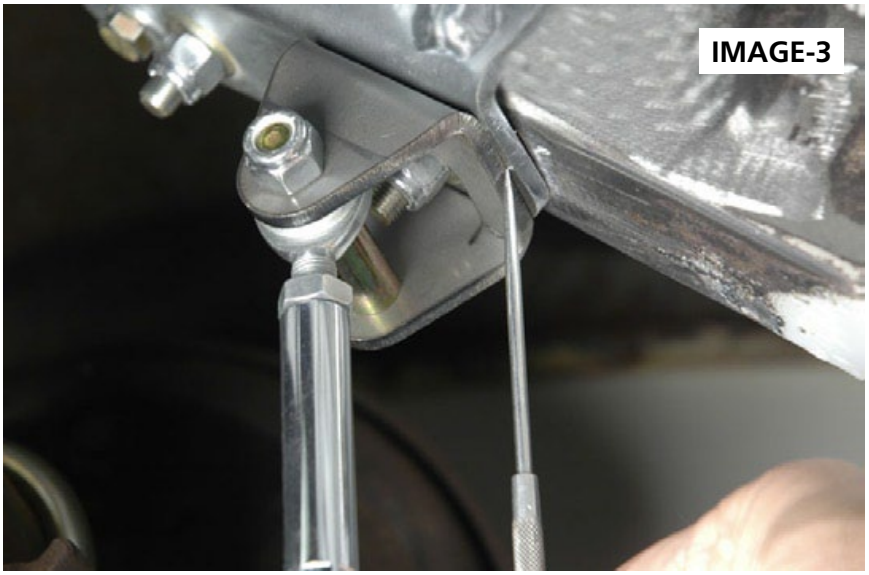
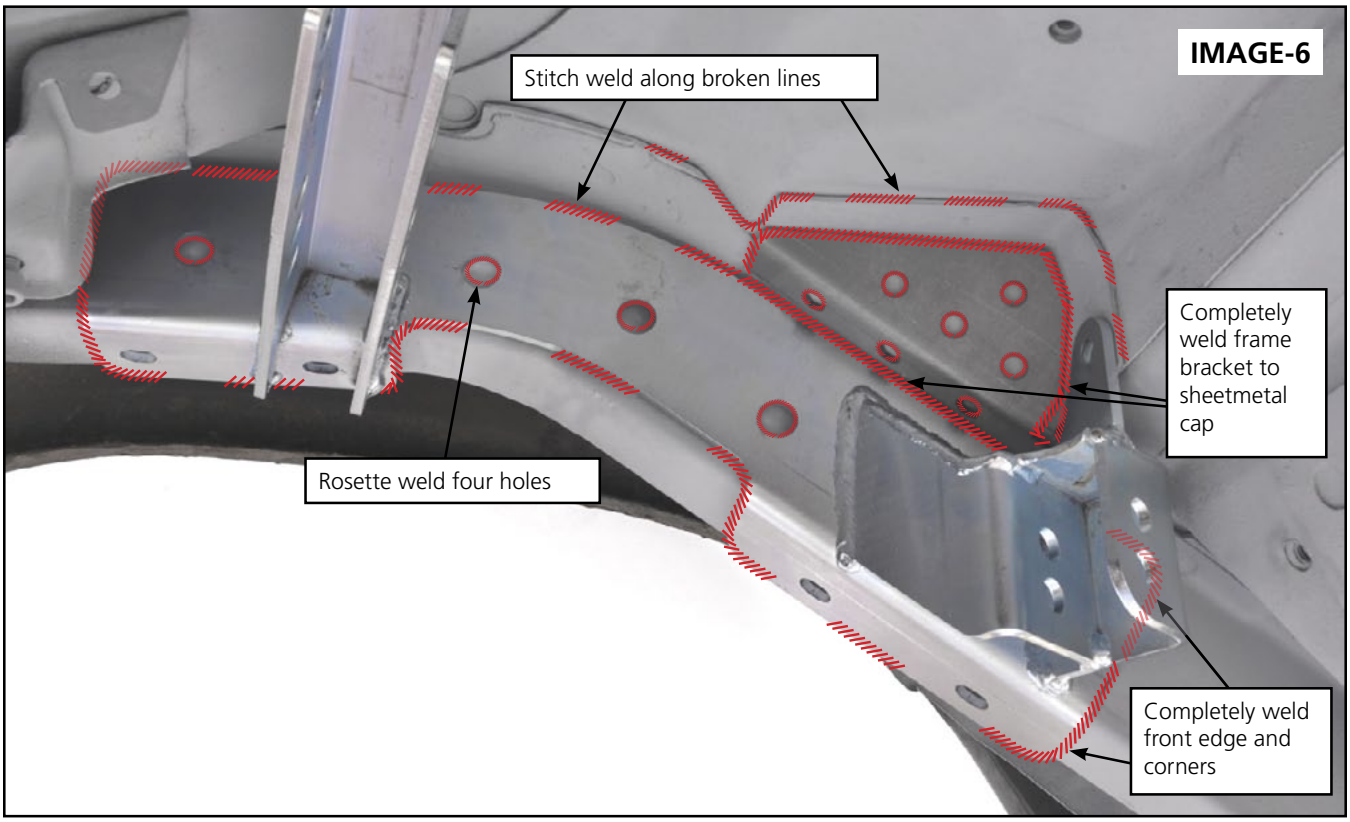


IMAGE-3

3. Barely visible in Image-4 is an extremely important connection above the upper control arm bracket assembly. The vertical support on the top of the bracket bolts the front of the upper control arm bracket to another significant hard point in the Camaro's undercarriage. If you look closely behind the bend in the brake line in Image-4 you can see that the tab has pulled completely away from the chassis and the bolt is missing.

Image-5 - This view from our instruction sheet shows the proper bolted installation of the support tab for upper control arm front bracket where it connects to the chassis.

At this point I would like to speak to all those who may have disparaging things to say about the builder who installed this incorrectly. If you never made a mistake at work then bash away. This should be a reminder to everyone that cars are not built all at the same time. Things are installed and removed numerous times. It is very easy to overlook or forget a step that you were going to do later. While we are at it, this particular kit comes with a 32-page instruction sheet and an additional 20 pages of shock & spring installation and tuning info. If you have additional questions call our tech line 916-388-0288. Please use the resources we have provided.



Weld-In Cap Sets

A few customers were having difficulty correctly installing the frame brackets due to a combination of poor welding skills and rotted frame rails. Image-6 Chassisworks added a crossmember cap to address these issues. The installation is easier to perform at home because of the significant increase in weld area around the critical control arm upper mount. The new caps are included with all g-Bar/g-Link suspensions purchased after May 1, 2012. Cap sets can be purchased separately to retrofit existing installations.

300-0165	Camaro/Firebird 1967-69 Cap Set	$15.00	**BUY NOW**
300-0166	Nova 1968-74 Cap Set	15.00	**BUY NOW**

Chassisworks First Generation g-Bar

Two images have been posted that show a g-Bar front upper-control arm mount that is attached to a torn frame rail. Image-7 shows the inside of the frame, Image-8 shows the outside of the frame. Chassisworks' first generation g-Bar was actually provided by a Chassisworks technology partner, Ridetech. This was never a secret. As a compliment to their air suspension system we provided a coil-over version of their air bar called g-Bar. Air-bar and g-Bar systems were an excellent product when used for their original design intent. They were intended to utilize soft rubber bushings to give a great ride and respectable handling improvement. This system was never designed for the impact loads of spherical rod ends, high horsepower or drag race starts.

If you look closely at image-8 you see the letters SPC on the upper control arm. This is a builder installed modification that removed the upper rubber bushed rod end and replaced them with a spherical rod end. This modification would have directly transmitted all suspension loads into the system without any of the dampening of the rubber bushed rod ends. This Results in significant additional loads to the system cradle beyond its original intent. Additionally, the u-bolts that attach the cradle to the stock frame have not been installed, requiring the welds to carry all the loads.

With the tremendous variety of components available and unlimited combinations of parts, it is impossible for a manufacturer to anticipate everything that a customer wants to use the car for. Our customers do not all have the same goals for their builds. So, as a matter of company policy, we encourage our customers to personalize their cars and modify our parts and push the envelope of the design. Some other manufacturers demand ultimate loyalty, they know best, no changes allowed. Where is the fun in that? Just remember, if you modify it or push it beyond its design you just might have to walk home.

It became clear at Chassisworks that we needed an additional style of rear suspension that could take more power, use bearing style rod ends and have anti-roll bars. We created g-Link, which has our own exclusive rebuildable pivot ball rod ends in the upper and lower bars along with several other design improvements and revisions. At the same time, we added the modifications from our g-Link system into our g-Bar style of suspensions. This took place in 2008, so there have been no Chassisworks produced original style 67-69 Camaro g-Bars for years. Other companies continue to sell this style of suspension because it's still a viable choice for many lower power and air suspension applications when used within its design parameters. Our g-Bar is a more modern version with additional features.

With the introduction of the g-Link, Chassisworks frame rail brackets were modified to take advantage of the unit-body hard points. By attaching to this hard point we actually have a connection stronger than the original g-Bar system with a round tube across the front. The multiple sheet metal panels form a rigid box which is much stronger and tied into the unit-body chassis better then the original dual crossmember design.

Highlights of Second Generation g-Bar

1. Our frame mounting with two separate frame side plates and a removable shock crossmember is actually a superior method compared to the original dual crossmember style. Let me explain why. Chassisworks laser scanned the floors and under carriages of multiple '67-69 Camaros. Exact 3D models of those undercarriages were developed which allowed us to get the optimum fitment. This led to a frame bracket design that confuses a lot of people. After scanning many vehicles it became absolutely apparent that as the cars were built in a multitude of factories with 60's technology and rotted out frames were replaced incorrectly, the rear frames commonly varied up to ½ inch. Way too much to be able to make a dual-crossmember fully-welded cradle that would fit tight and square in all variations of the car. Because of the inconsistencies in the cars we opted for a separate frame rail adapter with a bolt-in shock crossmember. This allows slightly different widths and twists in the frame to be easily accommodated. The need for a front crossmember was eliminated by designing a frame mount that took advantage of the natural unit-body hard points in the Camaro undercarriage. When installed correctly this multi-layer sheet-metal boxed section is significantly stronger than a small diameter tube welded across the frame. As you can see from the prior pictures, the examples of broken frames are from improper installations.

2. Chassisworks currently makes six separate styles of g-Bar and g-Link suspensions for 67-69 Camaros. In addition, each of those has numerous options.

    A. g-Bar with poly bushing arms and coil-overs
    B. g-Bar with poly bushing arms and air springs
    C. g-Link with pivot-ball arms and coil-overs
    D. g-Link with pivot-ball arms and air springs
    E. g-Link with billet pivot-ball arms and coil-overs
    F. g-Link with billet pivot-ball arms and air springs

A.

B.

C.

D.

3. Chassisworks g-Bar and g-Link System Features

   A. Clean sheet design; all components were originally designed specifically for these products.
   B. Available with single- or double-adjustable coil-overs and air-springs specifically designed and valved for the system by Varishock (our sister company)
   C. Billet upper link bars with choice of Poly or Pivot ball style
   D. Double adjustable control arm options
   E. Billet double shear lower shock mounts
   F. Adjustable ride height
   G. Three different lower control arms
   H. Two styles of adjustable anti-roll bars
   I. Adjustable anti-squat (instant center)
   J. Autocross and track tested
   K. Over 50 pages of installation and tuning instructions included.
   L. No fabrication or cutting of the stock floor required for installation
   M. Frame adapters attach to chassis hard points, eliminating need for second crossmember

E.

F.

4. Our systems have some significant advantages over the original style and products from our competitors. If these features are important to you then you should consider our system. But don't let some uninformed, self-proclaimed internet-expert tell you that our parts have deficiencies. I personally invite you to come and see us at the factory or at a show. Look through our data sheets and instructions online. Get the facts and decide for yourself. Join the thousands of satisfied customers that have one of our rear suspension systems.

My Car Will Not Sit As Low As I Would Like

There are threads about customers who want their 67-69 g-Bar equipped Camaro to sit lower.

Chassisworks g-Bar and g-Link systems were designed to be installed under the stock floor in a car with typical accessories, such as headers and subframe connectors. Also, to have enough ground clearance to be driven on a typical road. Not everyone is willing to own a car that the headers, subframe connectors and mufflers occasionally drag on the ground. Nor are they willing to listen to the tires rubbing on the body, the driveshaft banging in the tunnel or the rear axle bottoming on its frame stop. I can just imagine the amount of hate mail we would get from that. Our g-Bar and g-Link product was designed to actually be driven by the masses. Chassisworks has other frame and suspension products that will allow a much lower ride height. Check out our billet 4-Link rear frame clips, removal of floor is required. Or our new 5840-F20 g-Link suspension with frame which includes complete mandrel bent and fabricated rear frame with g-Link suspension that will fit under the stock floor. Currently this is available for 70-81 Camaro.

As more and more customers and builders have become willing to put up with the inconvenience of low ride height we have decided to offer two separate products to allow them an easy affordable way to lower their existing Camaro g-Bar and g-Link products.

When using a stock OEM rear frame and floor, ride height is controlled by a combination of three simple elements. Unfortunately there is not much leeway with them as ride height effects driveability.

Chassis to Drivetrain Clearance and Contact Height

How much room is there between the rear axle housing, driveshaft and tires with the chassis, undercarriage or body work, before there is contact? The first thing that hits is what determines how close the body or chassis can get to the drive train components. We call this Contact Height. The higher up in the body you can push the rear axle housing the lower the car will sit.

Tire Size

The size of your tire diameter affects the height that the rear axle is off the ground. A larger tire will raise the car, a smaller tire will lower it. There is absolutely nothing you can do about this. You have to be responsible for picking a tire that will at least give you a chance to achieve your desired ride height and body stance. An important thing to note here is a larger diameter tire and wheel will actually tuck up in the wheel well farther than a smaller diameter one and may give the illusion that the car is closer to the ground.

Suspension Bump Travel

Here is where the confusion starts and difficult decisions need to be made. Bump travel is simply the amount of travel the suspension has available before it reaches Contact Height with the chassis. Every vehicle has to have some bump travel. Ride height is achieved in a car by raising the body off the ground from the Contact Height up an amount equal to the required bump travel. Well that sucks because it makes your car sit 2 to 3 inches higher than you think it should. You do have a little leeway here but remember it is an extremely tricky balance between spring rates and bump travel that effect driveability, handling and ride quality.

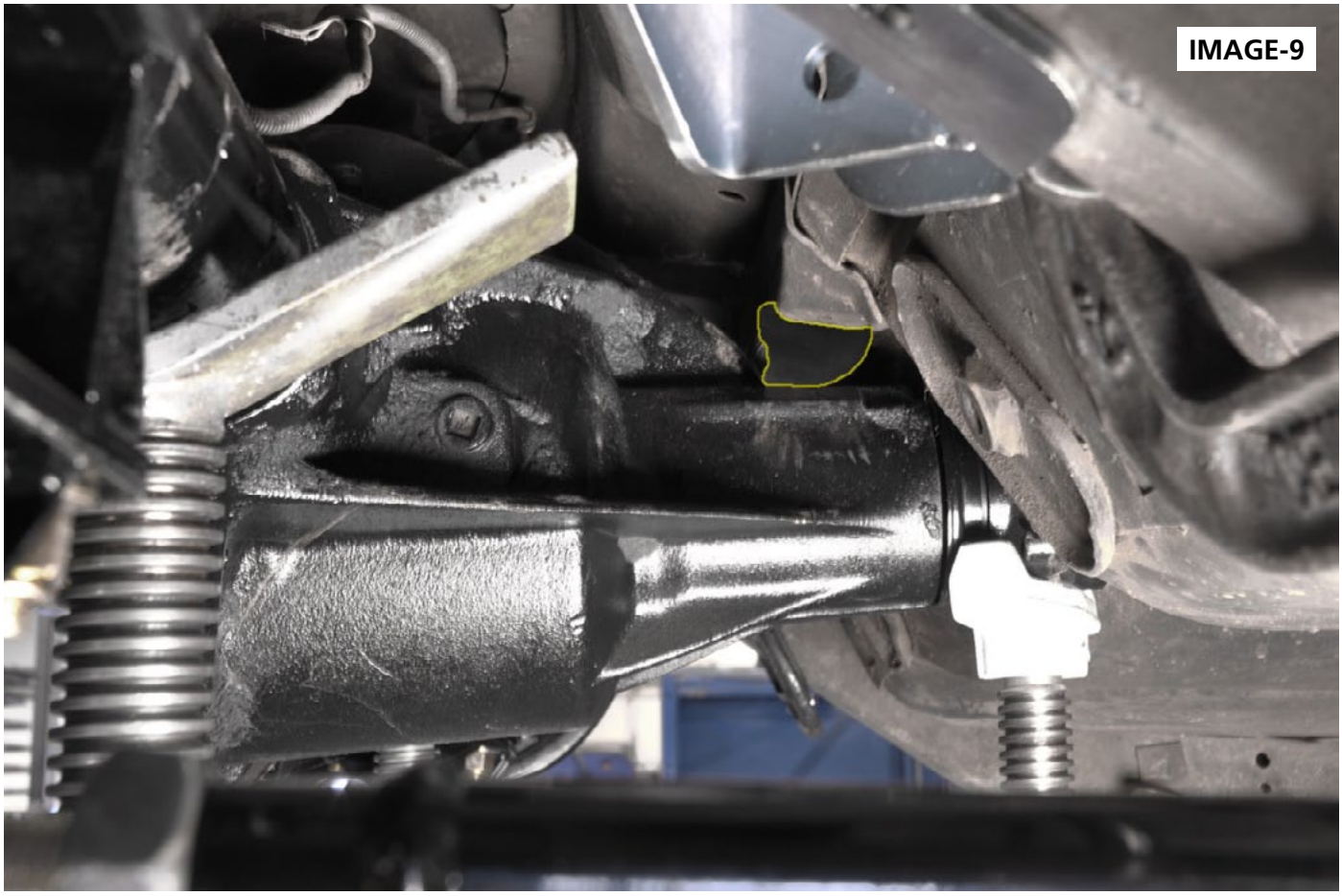
Here are basic points to consider. Will your vehicle have varying loads in it? Are there ever going to be four people in your car? How much do they weigh? Will you put heavy items in the trunk? If you plan to do any of this then you need to add bump travel because when you add weight the shocks will compress and some of the bump travel you need to prevent bottoming will be gone. This situation could easily require 3-1/2 inches of bump travel. The opposite end of the spectrum is this. I am only going to trailer my car to events and only my 110 pound absolutely stunning 24 year old sweetheart autocrosses it, because Baby gets whatever Baby wants. Then you could get away with a lot less bump travel; maybe as low as 3/4" With this little bump travel Baby's car will never be street drivable without a heavy spring rate to compensate for the low bump travel. Why don't I just put heavy springs on the car? It will sit way low and with Baby standing beside, it will be oh so cool. Not only will ride quality suck, but so will the cars handling, especially at autocross events.

Autocrossing, with its relatively slow speeds, requires soft suspensions to get some weight transfer to hook the cars. A stiff spring will make the car handle like a skateboard and slide all over the track. Through compromises in bump travel you can affect ride height. Unfortunately, the less bump travel available the harder it is to achieve good handling and ride quality.

If you are going to minimize bump travel or actually autocross your car a double adjustable shock will really help. By providing the ability to independently adjust each direction of shock travel you can increase the bump valving to assist the spring in preventing chassis bottoming or use the independent adjustments to dial in the track conditions. Chassisworks supplied VariShocks have a very large range of force adjustment, way more than its competitors. If initially purchased with the g-Bar or g-Link, the upgrade is only $100.00 per shock.

The vast majority of people do not want to cut the stock floor or the transmission tunnel in their Camaro, because it requires skills that are beyond most individuals capabilities. That is why Chassisworks g-Bar and g-Link systems were designed to fit under a stock floor pan. Chassisworks does make other systems that will sit much lower, but more fabricating skill is required to install them.

The limiting factor in achieving Contact Height is the first obstacle. During the design of the g-Bar and g-Link systems we positioned a stock axle housing in a Camaro and determined how far up in the body it would go before it made first contact. The pinion snubber hit the axle housing first. We compressed the pinion snubber some and set that height as our Contact Height. See Image-9. It shows a 10-bolt Camaro rear end with the g-Link axle brackets attached. The axle housing is pushed up in the car to a height that simulates the coil-over shock bottomed out. You will notice that the pinion angle is set correctly and the pinion snubber (out lined in yellow) is actually compressed some. Without modifying the floor, this is as low as this Camaro will ever set. There is an important thing to understand here; the minimum ride height for your Camaro was not determined by Chassisworks it was set by some long dead Chevrolet engineer! The only way to lower the car beyond here is modification of the unit-body. There are some things you can do to minimize this unfortunate absolute truth. And Chassisworks has two cool new components to help.



Two New Products To Lower You Car

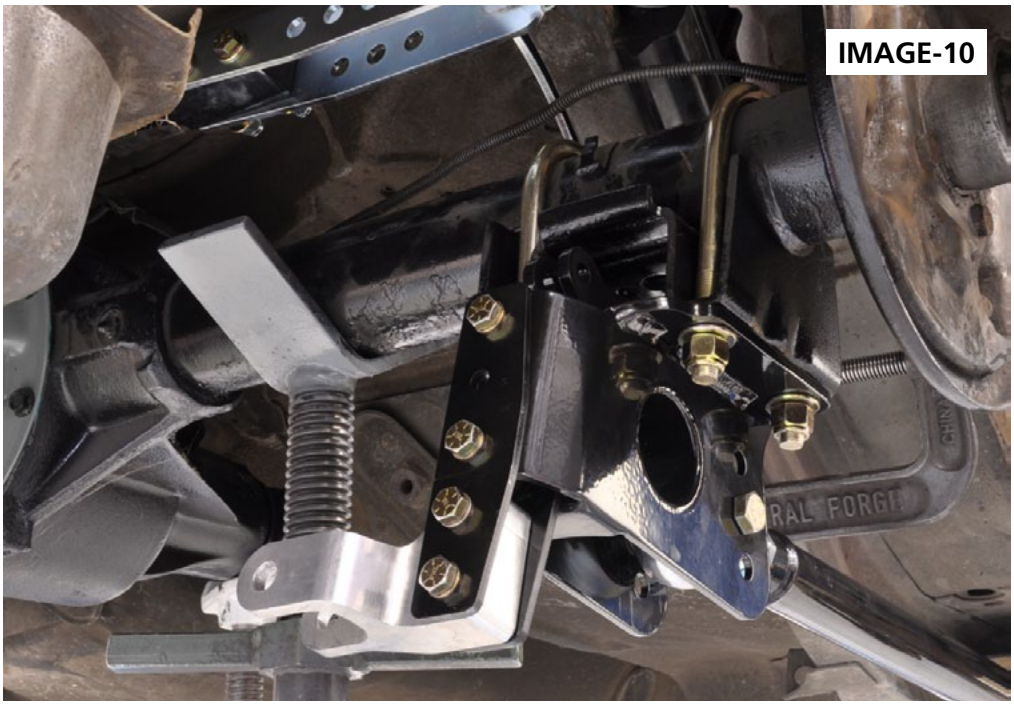
As more and more customers are willing to sacrifice bump travel for a lower ride height Chassisworks has come up with 2 methods to make your car sit lower with our existing g-Bar and g-Link systems. This will allow a lower ride height without the expense of a modified floor. It is important to remember that you are electing to minimize bump travel to achieve lower ride height with these new components. There will be clearance issues with some parts of the drive train. You must verify that you have not reduced the bump travel too much.

Suspension bump travel can be reduced at least three ways.

1. **Install Shorter Shocks** - The problem with this is, why buy more shocks and springs when you already have a good set; plus you loose the handling advantage of the longer shock with a lighter spring.
2. **Shorter Springs** - Disadvantage is the rate will have to get higher and the springs will fall off the seats. This lowers the bump travel in the shock, and coil-overs don't work very long if you bottom them out.
3. **Lower The Bottom Shock Mount Farther Below The Axle Housing** - This does not affect the bump travel of the shock. It reduces the bump travel of the suspension which is what you are trying to accomplish. This is the preferred method.

1. **Shock Mount Extenders** - Our first method is a simple bracket and spacer set that will allow you to lower the bottom shock mount either 1-1/4" or 2-1/2". See Image-10. Item number 300-0162 only costs $39.00 for a complete set of components for both sides of the car. Before you get too excited this product comes with limitations. This product will add an additional set of mounting holes to the adjustable lower shock mount, which will lower your car either 1-1/4" or 2-1/2" depending on how the lower billet shock mount is attached.

300-0162	Lower Shock Mount Extenders	$39.00	**BUY NOW**



This kit was produced for the static display fair grounds customer. Air suspension equipped cars have enjoyed a significant advantage in the static display arena for years. They just let the air out of the suspension and the car sits real low, then looks extra cool. Now you can display laid out just like an air car by just attaching this bracket extension set. Your car will not be drivable in the lowest setting but no air system car can be driven that low either. Not all combinations of control arm holes will be useable and you need to be very careful that you don't bind the suspension links. If the 2-1/2" reduction is too low, flip the lower mounts over and the car will only sit 1-1/4" lower. You may be able to actually drive the car with the 1-1/4" reduction in bump travel, but the shock brackets lowest edge will be below bottom of an 18 inch diameter rim so the ground clearance is way too little to drive it like this on a public road.

2. **g-Bar Lowering Blocks** - Our other new lowering kit comes in 2 versions 300-0163 for mono-leaf axle housings and 300-0164 for multi-leaf axle housings. Both are available at $99.00 a pair. See Image-11 This kit consists of a billet aluminum 1-1/4" tall spacer with longer u-bolts that attach the spacer between the OEM leaf spring mount on the axle housing and the lower control arm mount with its attached adjustable shock mount. This effectively lowers the bottom adjustable shock mounts an additional 1-1/4". With careful consideration applied to determining the acceptable amount of bump travel reduction this system will allow you to lower your car either 5/8" or 1-1/4".

   The advantage to this system is you do not lose quite as much ground clearance under the lower control arm bracket but it is still way below the rear axle housing. The ground clearance under the bracket becomes very important to clear road obstacles and to survive a flat tire.
   This system is intended to be used on cars that are actually driven. Although not verified by us it is very possible these lowering block sets will fit on other companies systems. You are responsible for determining the acceptable bump travel reduction. Personalizing your build is a lot of fun! Pay attention to the components that reach contact first and start modifying things to get more clearance. Go in slow methodical steps and you will be successful.

300-0163	Lowering Block Kit, GM Mono-Leaf	$99.00	**BUY NOW**
300-0164	Lowering Block Kit, GM Multi-Leaf	99.00	**BUY NOW**

The logical place to start chassis modifications for additional clearance is to remove the pinion bump rubber and its sheet metal mount. The instruction sheet shows how to do this. Our instruction sheet shows this procedure solely for the purpose of gaining enough additional clearance to clear the much larger diameter pinion support on the Ford 9" FAB9 used in the instructions. Simply removing the pinion snubber with a 10- or 12-bolt rear end will allow the axle housing to sit higher in the car but the driveshaft will very quickly hit the tunnel and the axle housing will soon after contact the shock crossmember.

Shock Crossmember Fitment Solutions

Occasionally there appears a fitment issue with the shock crossmember and the top rear portion of the axle housing or the filler cap on a FAB9 in a standard g-Bar or g-Link installation. These issues fall into 2 categories.

A. The suspension can be adjusted to resolve clearance issue.

Usually the issue is just that the suspension is not adjusted properly. Start with the rear axle housing mocked up at ride height . After you are done verifying everything you will also need to check for clearance at full compression, full extension and axle housing roll of the shocks travel. Verify that the vehicle has the correct wheelbase on both sides. Don't simply just set it to the starting length in the instruction sheet.

If clearance is low, shorten the wheel base by screwing in the top and bottom control arms while keeping the pinion angle correct. There is no law of the universe that says you have to keep the exact stock wheelbase. The housing moves in an arc, this causes the wheel base to change anyway.

It is imperative that the pinion angle is correct. As the pinion angle is adjusted you can see that the top of the axle housing moves back and forth.

With the plethora of transmission adaption crossmembers that are available some of your problems could be there. Many transmissions that you might want to adapt into your car do not actually fit in the stock tunnel. So Super Duper Transmission Crossmember Guy lowers the back of the transmission with his new crossmember to clear the floor. Besides making the headers drag even worse on the ground it changes the required pinion angle adjustment on the rear end. As the transmission goes down the pinion rotates up to attain the correct angles. As the pinion rotates up the shock crossmember clearance on the top back of the rear axle housing disappears making your problem worse. This is not a time to be in love with rear end girdles as they drastically decrease the shock crossmember clearance. You may have to modify the crossmember. Saw off its mounting blocks rotate it for more clearance, then weld it back in. As you can see things really start to snow ball out of control and a lot of work can be required for just a little more drop. The larger diameter Ford rear ends are much stronger but their extra size will use up more of your precious clearance.

B. The suspension cannot be adjusted to resolve clearance issue.

Anyone who has lived long enough to have a driver's license knows that sometimes the universe conspires to screw you. If all the adjusting in the world won't get you the required clearance you will have to modify the crossmember. It is not your lucky day; don't waste any money on lottery tickets.

The easiest way to modify the crossmember is to cut the solid square blocks off the ends of the crossmember, bolt the blocks back into the frame brackets. Rotate the bent tube portion to clear your obstacle don't be afraid to do a little floor massaging or crossmember bending to get some additional clearance. Before you do this repeat step A; or you would not be the first person who did this unnecessarily.

Hopefully the time spent reading this gave you some clarity about the discussed issues.

Chris Alston