C7 DELRIN BUSHING INSTALLATION

Thank you for purchasing the Borg Motorsports Delrin Bushing Kit for the C7 Corvette! All of our bushing kits are designed to improve the handling of your Corvette by reducing the elasticity of the suspension bushings.

The kit is legal for several racing classes including SCCA ST and SP autocross classes as well as any other rule set that requires the use of bushings with no more metal than stock.

Recommended Tools and Supplies

- Metric sockets and wrenches
- Vehicle jack
- Jack stands
- Ball joint separator
- Hydraulic press or large vise
- Snap ring pliers
- Electric drill
- Brake cleaner
- Hack saw or rotary tool with cutting disk

Instructions and Video

A PDF copy of these instructions and a video of the installation process are located here: http://www.borgmotorsports.com/instructions/

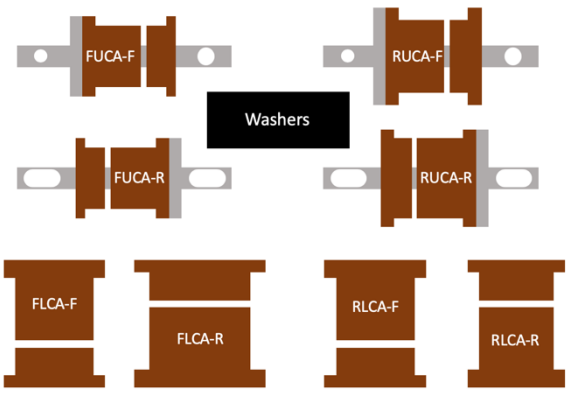
Please note that the installation video is of the C5/C6 kit, which differs from the C7 during the stock bushing removal process.

Unpacking

Your Delrin Bushing Kit comes packaged in two levels. Each level is for one side of the car (one left and one right). The bushings on each side of the car are identical so either level can be used for either side. It is recommended that you leave the bushings in place within their foam inserts as you work through the install to help you track which bushings go to each position.

Kit Contents

- Bushing halves (32)
- Aluminum sleeves (8)
- Aluminum Trunnions, aka. Dog Bones (Front – 4, Rear - 4)
- Shims (16)
- Snap Rings (8)
- Machined Washers (Front – 4, Rear - 4)
- Borg Motorsports stickers (2)



FUCA – **F**ront **U**pper **C**ontrol **A**rm

RUCA – **R**ear **U**pper **C**ontrol **A**rm

FLCA – **F**ront **L**ower **C**ontrol **A**rm

RLCA – **R**ear **L**ower **C**ontrol **A**rm

Figure 1. Box contents.

Safety

Installation of these Delrin bushings requires an appropriate amount of mechanical knowledge and ability. If you do not have the abilities or are not comfortable with all aspects of these instructions, please consult a professional mechanic for installation. Incorrect installation can result in unintended performance and/or vehicle or property damage. Please read through all the instructions before proceeding with the installation of these bushings. Always use proper personal protective equipment (ex. safety glasses, gloves, etc.). See the disclaimer on the final page for more information.

Control Arm Removal

Follow the factory service manual for your specific year of vehicle for the removal of the control arms. Use caution as the springs are under compression, even when the suspension is at full droop. It is recommended that you remove the control arms from the uprights (steering knuckles) for ease of removing the stock bushings.

Bushing Removal Overview

The stock bushings consist of an inner sleeve and outer housing connected by rubber. These three components are manufactured into one bushing unit and each bushing is difficult to remove. Borg Motorsports recommends one of two methods for bushing removal:

- The press out method (POM)
- The cut out method (COM)

DO NOT burn the bushings out. This method can damage the control arms and poses fire and health hazards.

The first portion of the stock bushing removal is the same for both processes. Each process will be divided into its own section. Please follow along with the process you have chosen to use.

1. For both processes, remove the stock washers from the lower control arm bushings. Some washers can be popped off with a punch and a hammer. Insert the punch through the metal sleeve inside the bushing and press it against the

lip of the washer. Use a hammer on the punch to pop the washer off of the opposite side of the bushing.

For stubborn washers, use a drill to enlarge the center hole of the washer. Enlarging this hole will separate the outer part of the washer from the part that is retained in the metal sleeve. This process is shown in Figure 2. Repeat this process for all lower control arm bushing positions.

Figure 2. Drilling the bushing washers off.

2. With the washers removed, you will now cut the steel lip of the bushing housing on the outboard sides of the control arm. Using a saw or rotary tool with cutting disk, carefully slit the lip of the steel bushing housing. You may need to use a utility knife to remove some of the rubber on the lip to better access the surface. It is best to slit the steel close to the aluminum of the control arm, but not all the way through the steel. With a slit made in the steel, a screw driver or pliers can be used to bend and wiggle the section of steel to be removed to detach it from the rest of the housing. Figure 3 shows the minimum removal amount for the COM process (minimum of two places). For the POM process, remove or bend inward the entire outer lip of the housing.

Figure 3. Previously removed bushings showing the cut steel lips.

Bushing Removal – Cut Out Method (COM)

3-COM. Using a drill (approximately ¼" diameter), drill through the rubber of the stock bushings between the inner steel sleeve and the outer steel housing. You will need to drill in several places to remove as much rubber as possible. Be careful as the rubber can grab the drill and quickly pull it into the bushing.

With several holes drilled, you may need to move the drill back and forth to help separate the inner sleeve from the outer housing. For stubborn areas, you can also use a utility knife to cut between the holes you have drilled in the rubber. Once sufficient rubber is removed, you will be able to remove the steel sleeve from the outer housing. Repeat this process for all lower control arm positions.

4-COM. To remove the upper control arm bushings, the inboard side of the trunnion will need to be cut away with a saw to access the rubber. Figure 4 shows where to cut the trunnions.

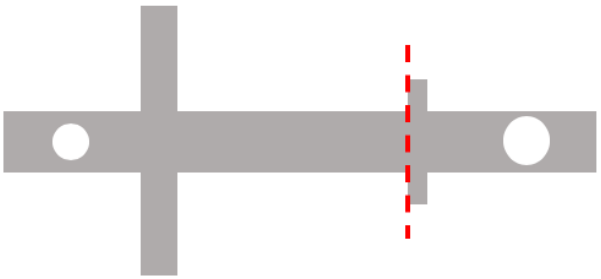


Figure 4. Cut the trunnions at the dashed red line.

Repeat for all upper control arm positions.

5-COM. With the trunnions removed, you now have access to the rubber. Repeat the process described in step 3-COM to remove the trunnions from the outer housings.

6-COM. Once everything inside the outer housings has been removed, use a saw to carefully cut along the length of the outer housing in two places that correspond to with the sections where the outer steel lip was removed. If using a hack saw, you will need to remove the blade, insert it through the center of the steel housing, then reconnect the blade to the handle.

These cuts will allow the outer housing to separate into two halves that can be removed by hand. Figure 5 shows one cut location. The second location is on the opposite side of the housing.

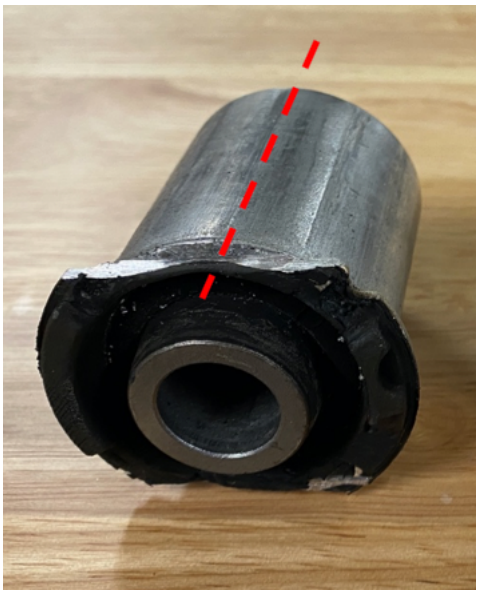


Figure 5. Sample location for the steel housings shown by a dashed line on a pressed out bushing.

7-COM. Repeat this process for all control arms. Once the outer housings are removed, clean the inside of the control arms with alcohol or brake clean and proceed to the bushing installation section.

Bushing Removal – Press Out Method (POM)

3-POM. Using the removal kit spacers, find the appropriate spacer for bushing position you are working on removing. Place the smaller spacer on the inner side of the bushing (without the lip) and place the larger ring/cup on the outboard side (where the housing lip used to be). This outer ring will need to contact the surface of the control arm without pinching any of the bushing housing. Figure 6 shows an example of this on a previous removed bushing.

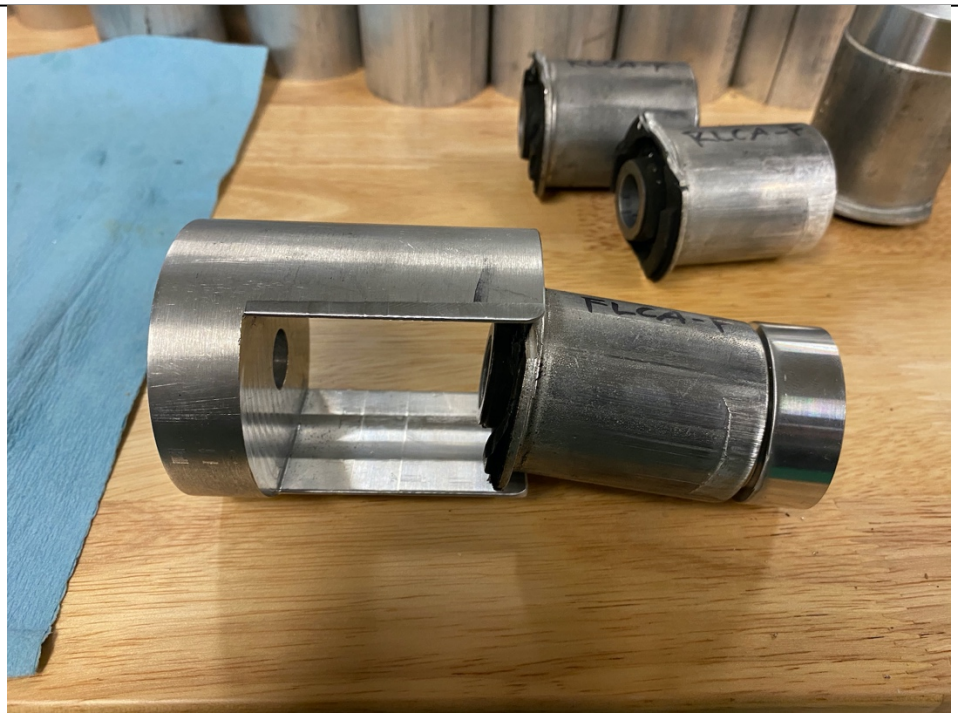


Figure 6. Example of spacer configuration when pressing out a bushing (Note that this image includes preproduction spacers. Your spacers may have a different appearance).

Place the assembly in a hydraulic press and slow apply pressure to the assembly. Make sure the smaller spacer is not catching on any part of the control arm as you begin to get movement of the bushing. You may need to place a socket or equivalent behind the spacer as the bushing is pressed out of the control arm.

Repeat this process for each of the lower control arms.

4-POM. The upper control arm removal follows a similar process, but the trunnion must be removed/modified for the procedure to work. First, cut the trunnion at the dashed lines as shown in Figure 7. Use caution to make sure you don't cut into the control arm. We found it easiest to cut the washer off of the front of the trunnion in pieces before cutting the main part of the trunnion off of the bushing.

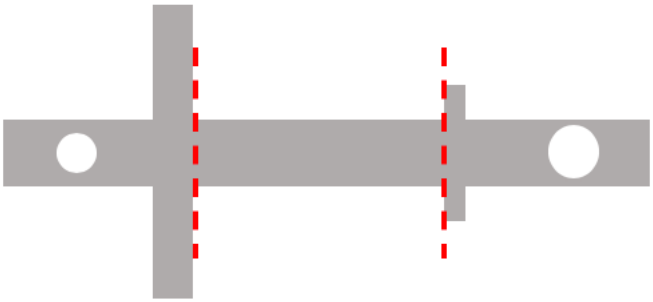


Figure 7. Trunnion cutting locations.

Find the appropriately labeled spacers and place the smaller one on the non-lip side of the bushing with the larger one on the side where the lip was removed. Place the assembly in the hydraulic press and carefully apply pressure to push the bushing out. As with the lower control arms, you may need a socket or other spacer to get enough travel out of your hydraulic press, depending on how it is designed.

Repeat this process for all upper control arm positions.

5-POM. With all bushings removed, clean the inner sections of the control arm housing with alcohol or brake cleaner to make sure all debris is removed prior to Delrin installation. Once this is complete, proceed to the installation process below.

Bushing Installation

1. Each bushing is made in two halves, with each half being a different overall length. The longer of the two bushing halves must be installed from the outside of the control arm, while the thin half of the bushing must be installed from the inside of the control arm. Please reference Figure 8 for a diagram of this orientation. All lower control arm positions require washers.

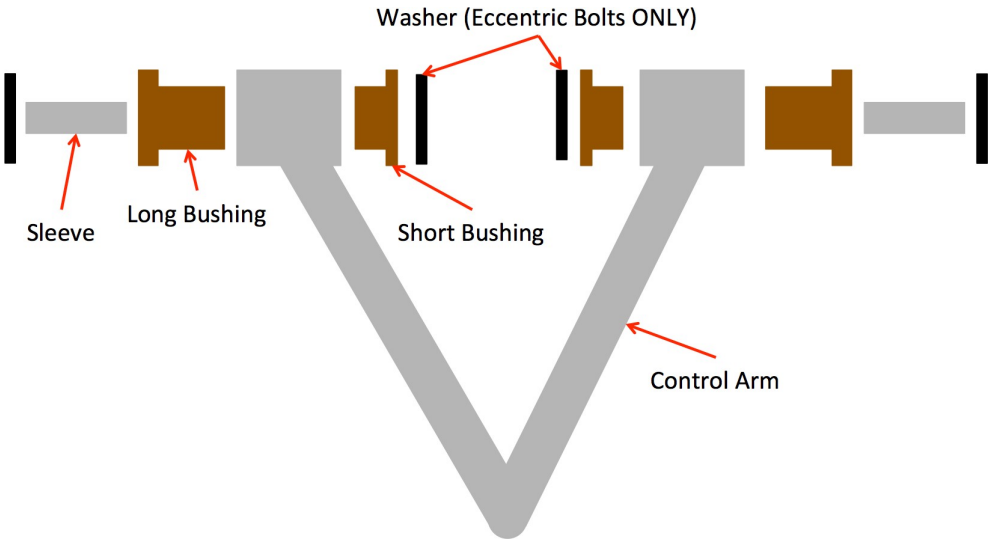


Figure 8. Assembly diagram of bushings.

2. Using the location of the bushing in the packaging (Figure 1) and referencing Figure 8, press each bushing into the appropriate location. Some bushings may require moderate force to install, but should not need a press. A bench vise or c-clamp can be used to fully seat the bushing in the control arms.

   The rotational position of the bushing does not matter; simply press the bushings into the arms.

3. With the Delrin installed in the control arms, install the metal sleeves into each bushing. All inner sleeves are the same as each position on the C7 uses an eccentric bolt for alignment adjustments. The inner sleeves have are longer than the assembled bushings as this extra length allows for the installation of the washers (shims). Each eccentric position uses one of the included shims on each side of the bushing.

4. Upper control arms use trunnions (dog bones) instead of sleeves. To install the trunnions, refer to the location of the trunnion within the packaging. Front position trunnions have a small locating hole in the front position and a larger hole in the rear position (see the left side of Figure 9). Rear dog bones have two equal sized slots on each end of the dog bone (see the right side dog bone in Figure 9).

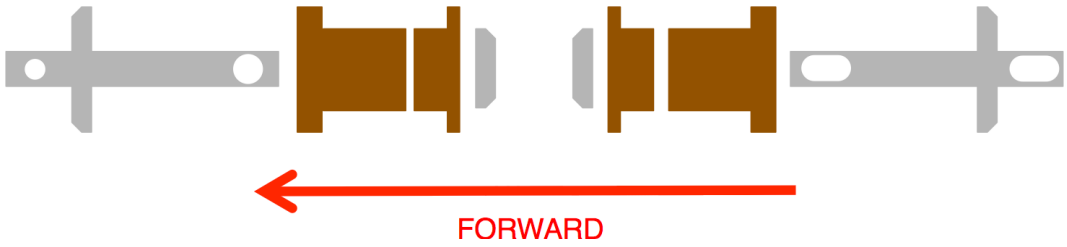


Figure 9. Assembly orientation of the upper front control arm dog bones for all kits (upper front and rear control arms for aluminum frame kits).

Insert the dog bone from the outside of the control arm until the flange meets the bushing. Once inserted, install one of the machined washers on the inside of the bushing. Use the supplied snap rings to hold it in place. The snap ring may be difficult to seat depending on the width of the control arm housing. A vise or clamp can be used to compress the assembly to allow more room to seat the snap ring. It also may be necessary to stake the snap ring, which can be accomplished by seating each end of the snap ring with a flathead screw driver and a mallet. When the snap ring is properly seated, the ends of the snap ring should have a gap of less than 0.1”. Repeat this process for all upper control arm positions.

Please note that the trunnions have an asymmetric design. The larger flat that is closer to the center of the trunnion is the surface that mounts to the frame. The smaller flat further from the center of the dog bone faces out. This adds additional negative camber to the suspension.

Control Arm Installation

5. Once all bushing positions are installed in the control arms, reinstall the control arms on the car by following the instructions in the factory service manual. All of the torque values used with the stock bushings can be used with the Delrin bushings.

   For the upper control arm positions, make sure that any washers installed behind the stock control arms are replaced behind the trunnions when reinstalling the control arms. These washers are used by GM to account for manufacturing variability in the frames and to properly distribute the load from the control arms to the chassis. Usually there is one thicker washer that is

required to be between the frame and the trunnion to properly spread the load but refer to your specific year service manual to determine if there is a different requirement.

If you are unsure of where the washers should be installed, you can hold the control arm against the frame without bolting it down and look to see which bolt hole locations have a gap between the frame and the trunnion. Fill these gaps with the washers so that each of the four mounting bolt positions on a given control arm are pressing against a washer before being bolted to the chassis.

Shakedown and Alignment

6. Once the control arms have been installed and the car is on the ground, perform a preliminary alignment of the toe. The toe change should be minor, but a toe-out condition can create an unstable feeling when applying power in a RWD vehicle. It is not recommended that you drive the vehicle until you have confirmed that there is sufficient toe-in on the rear axle.

7. With the toe corrected, perform a shakedown run. This process consists of driving the vehicle slowly (think warm-up or scouting laps) on the track or a TNT autocross course. Listen and feel for any unusual noises, vibrations, or clunks. The Delrin bushings will greatly increase the road feel and cabin noise, however there should be no clicking/clunking. After the shake down run is complete, recheck the suspension bolt torques.

8. After a successful shakedown run, the vehicle can be fully aligned. Please note that adjustment of the bushings during alignments may require more force than with the factory bushings. This is normal and is not a cause for concern as Delrin, while stiff, can still deflect enough to allow normal factory alignment.

Alignment Recommendations

Below are the recommended started alignment settings for the vehicle. Please keep in mind that each use situation is different, and your alignment settings could vary greatly depending on other vehicle modifications and your choice of tire. Always test to determine what works best for your specific application.

Autocross Starting Settings

Front Camber: -3.0 deg
Front Caster: +7 deg
Front Toe: 0.1 deg out

Rear Camber: -2.0 deg
Rear Toe: 0.1 deg in

Road Race/Time Trials Starting Settings

Front Camber: -3.0 deg
Front Caster: +7 deg
Front Toe: 0.05 deg out

Rear Camber: -2.0
Rear Toe: 0.05 deg in

Installation Video Address

Borg Motorsports provides videos for the installation of our products. Please visit http://www.borgmotorsports.com/instructions/ for links to our installation videos. You can also find these videos on the Borg Motorsports YouTube channel.

Disclaimer

Motorsports is inherently dangerous. Borg Motorsports is not responsible for improper installation methods, modifications, or changes to the product that occurs during the installation. Borg Motorsports or the selling dealer is not liable for any loss, damage, or injury due to the direct or indirect use of this product. All components sold by Borg Motorsports are intended for off-road use only.