
Cobra IRS Aluminum Differential Bushings (MMIRSB-40.2)



Read all instructions before beginning work. Following instructions in the proper sequence will ensure the best and easiest installation.

Congratulations on choosing the finest IRS differential bushing kit available. Unlike many others who offer only the front differential bushings, Maximum Motorsports took the time and effort to actually analyze the IRS system. The MM Engineering Team realized that *all* of the differential bushings must be replaced as a set. The complete set includes the two front bushings and the essential single rear bushing. If only the front bushings are replaced, and the original rubber rear bushing is left in place, a mismatch will be created in the stiffness of the bushing materials. The more rigid front bushings will deflect less, while the remaining rubber rear bushing will still deflect as much as ever. This in turn will increase the stress on the aluminum front mounting ears of the differential housing. The increased stress can lead to fatigue and stress cracking of the aluminum differential housing. Wheel hop will still be prevalent because the rubber rear bushing will still deflect and allow the differential to flop around.

There are many features that set our differential bushing kit apart from the others.

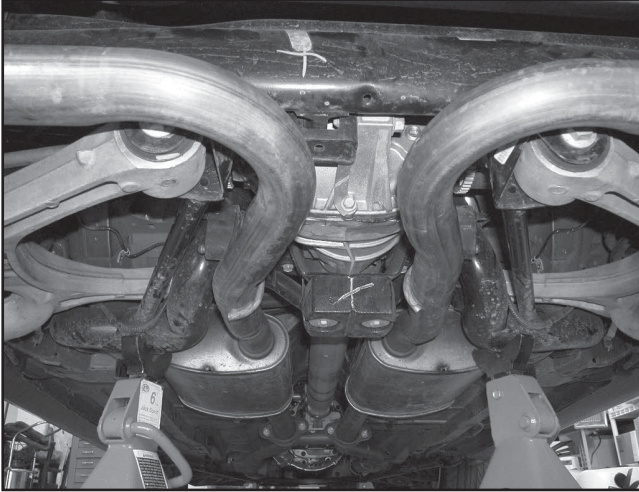
- The MM Aluminum Differential Bushing Kit allows the pinion angle to be raised by as much as 4.5 degrees. This means that the pinion angle can be adjusted to minimize driveline vibrations.

- The MM front differential bushings are comprised of specially machined spherical washer sets. This allows compensation for the changed angle of the differential housing. If these aluminum bushings did not have this feature, the stress on the differential mounting ears and the IRS subframe would be increased.
- Unique to the MM kit is the rear bushing. Overlooked by others, this bushing contributes just as much to reducing wheel hop as the front differential bushings.
- The aluminum bushings are surprisingly unobtrusive. The change in NVH is minimal. There is a slight increase in the noise level from the ring and pinion gears. Changes in vibration and harshness levels are virtually unnoticeable, with the exception of driveline vibrations being reduced due to the corrected pinion angle.

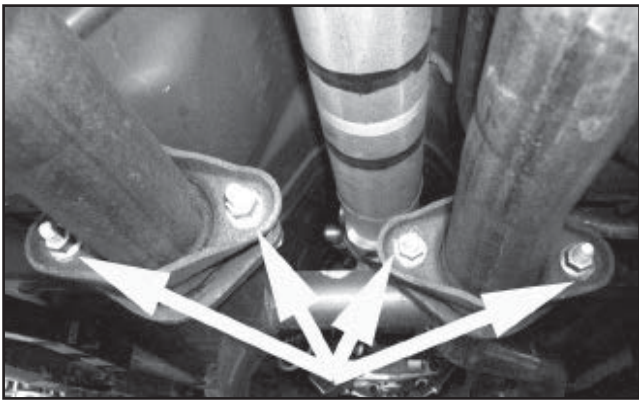
Pinion Angle Theory

The pinion angle is important because it affects driveline vibrations and U-joint longevity. Commonly accepted practice is for the pinion angle to match the engine angle in the situation of the greatest driveline loads. With the Mustang IRS, particularly after installing the MM Aluminum Differential Bushings, the pinion angle can be assumed to be unchanging (unlike a solid axle). To minimize driveline vibrations MM recommends that the pinion angle be adjusted to match the engine angle. Unless extensive and unusual modifications have been made, the engine angle will always be between 3 and 4 degrees down at its rear. The stock Mustang IRS pinion angle is usually about 1 degree down at its front. The pinion angle should be adjusted to match the engine, which would place the pinion up at 3 to 4 degrees.

1. Safely jack the car up and support it firmly on jack stands. Place the front jack stands under the front K-member, between the pivots of the front control arms. Place the rear jack stands underneath the forward most point of the IRS subframe, near where the subframe attaches to the chassis.

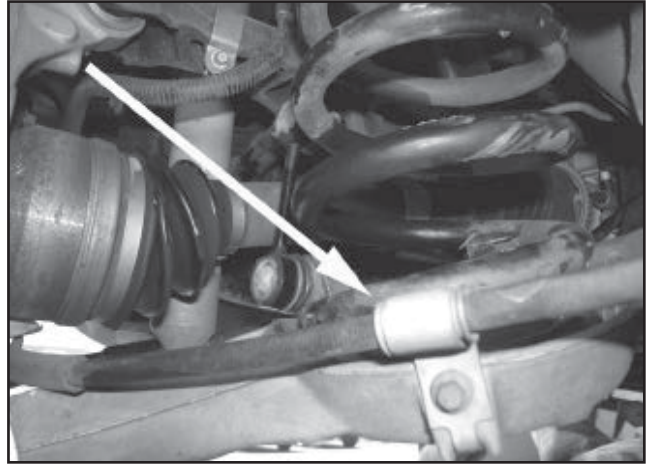


2. Remove the rear wheels from the vehicle.
3. Remove the tail section of the exhaust from the vehicle, disconnecting it at the front of the mufflers. A flat-head screwdriver is useful in prying the rubber exhaust hangers from the exhaust.

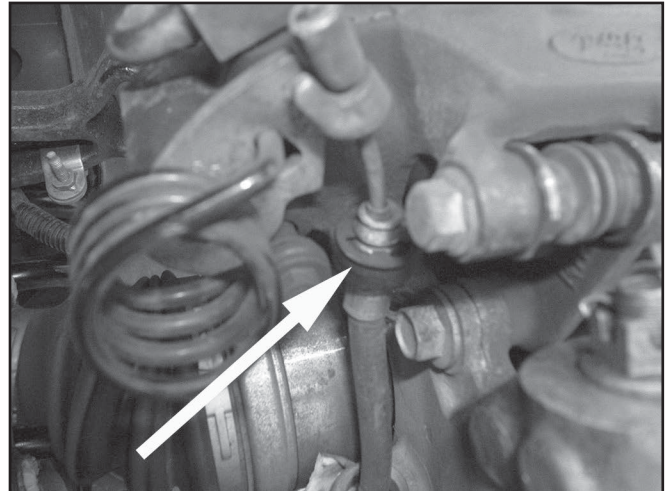


NOTE: Measure the pinion angle. This can be done at any time after Step 3 and prior to Step 25. It can most easily be done after Step 22. See the Pinion Angle Addendum Sheet on the last page of this instruction packet.

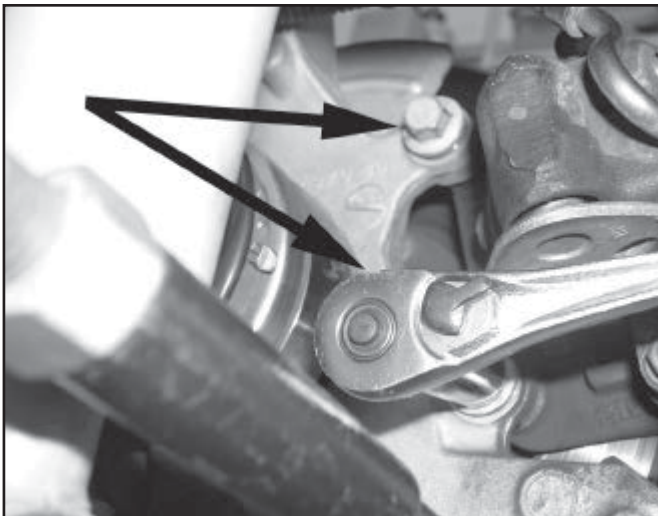
4. Unbolt the parking brake cable mounting-bracket from each control arm.



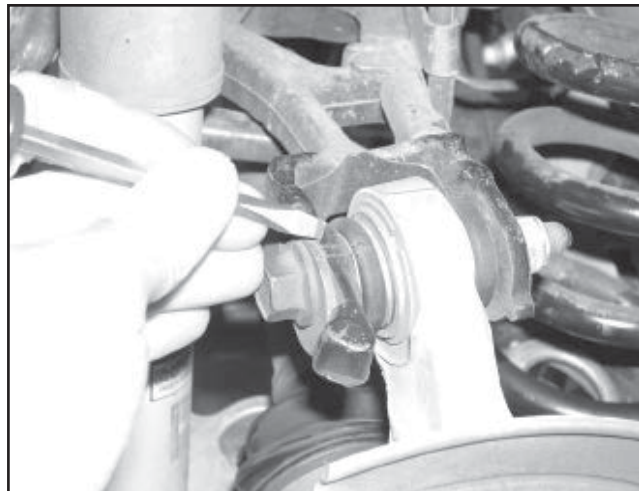
5. Make sure the parking brake is not set, and then remove the parking brake cable housing retaining clip on each caliper.



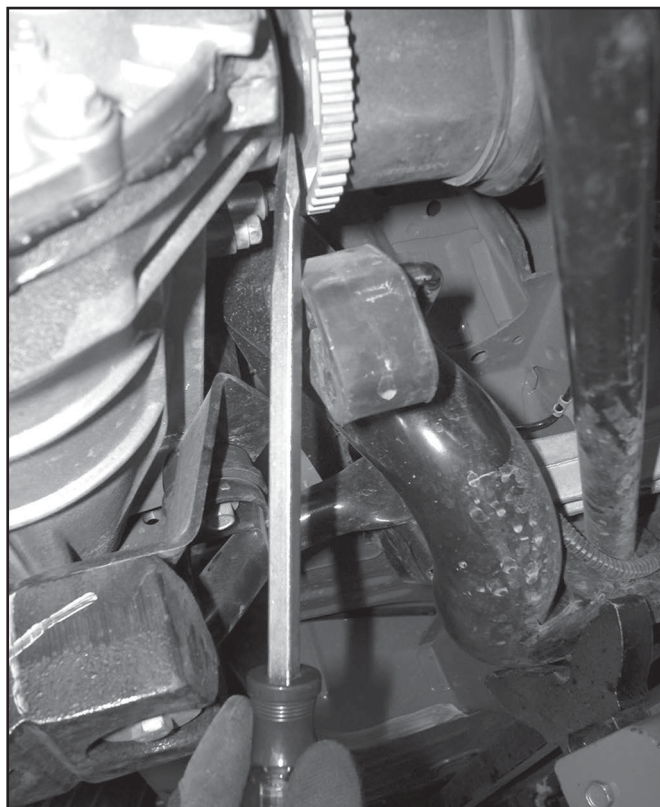
6. Disconnect the parking brake cable from the parking brake lever on each caliper. Remove the cable from the locating hole in the calipers.
7. Remove the two bolts holding the caliper assembly to the spindle on each side. DO NOT allow the calipers to hang by the brake hose. Damage to the brake hoses may result. Using a zip-tie or safety wire, hang the caliper from the upper portion of the IRS subframe.



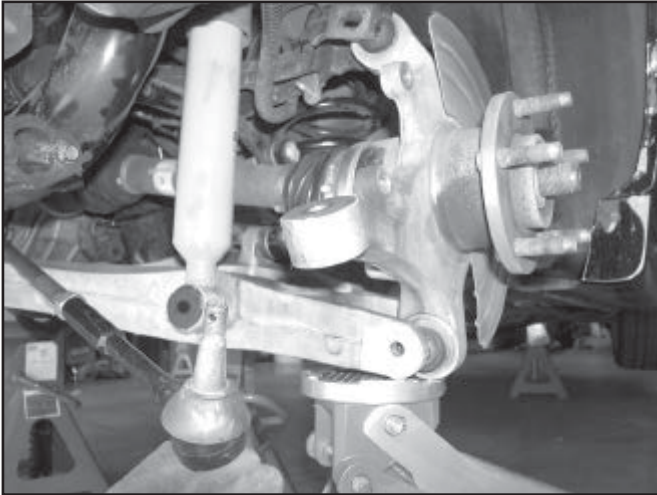
8. Remove the cotter pin and nut that secure each tie-rod end to the rear spindle.
9. Remove the tie-rod ends from the spindle. Be very careful and avoid directly striking the tie-rod end, as damage to the threads WILL occur.
10. Using an awl or other sharp object, carefully mark the position of the eccentric camber adjustment bolt on the upper control arms. Aligning these marks during reassembly will maintain the rear camber setting.



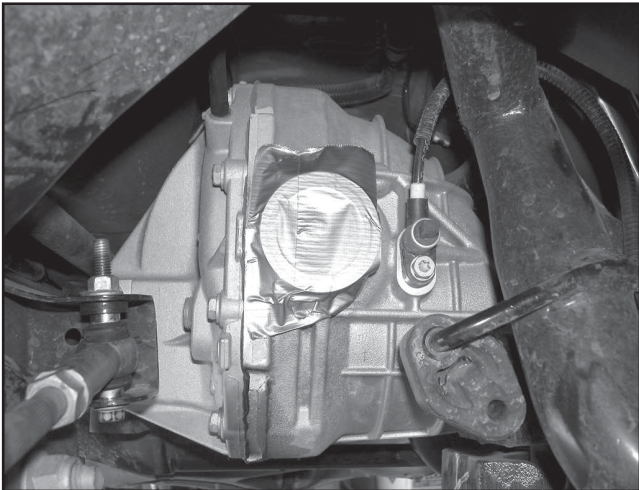
11. Loosen the upper and lower spindle mounting bolts.
12. Remove the lower spindle-mounting bolt on each control arm.
13. Place a large flat-head screwdriver or pry bar between the differential housing and axle half-shaft. Carefully pry the half-shaft out of the differential. Apply enough pressure to overcome the internal circlip. Care must be taken to avoid damaging the axle seal and axle bearing surfaces. Repeat Steps 12-13 for the other half-shaft.



14. Use a floor jack to support the passenger side lower control arm, and remove the lower shock-mounting bolt. DO NOT allow the control arm to rest on the sub frame; the coil spring is still exerting significant force, and damage to the control arm may result.
15. Pull out the upper spindle-to-control arm mounting bolt and carefully remove the axle half-shaft/spindle assembly. Take care to avoid damage to the differential seal.

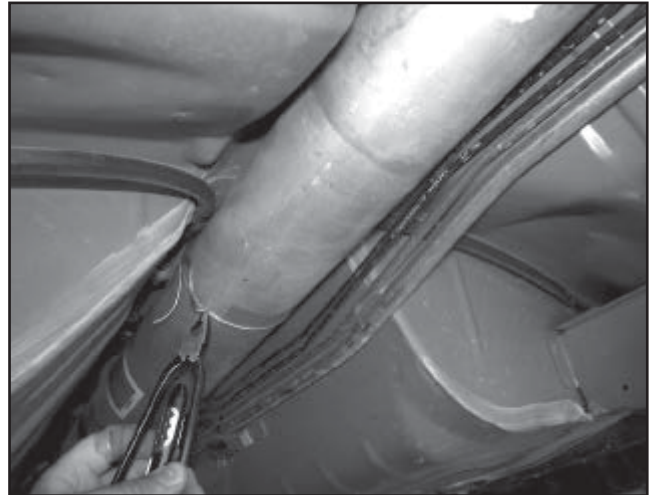


16. Remount the lower shock bolt and tighten.
17. Lower the floor jack.
18. Using tape, cover the hole in the differential to avoid contaminating the oil.

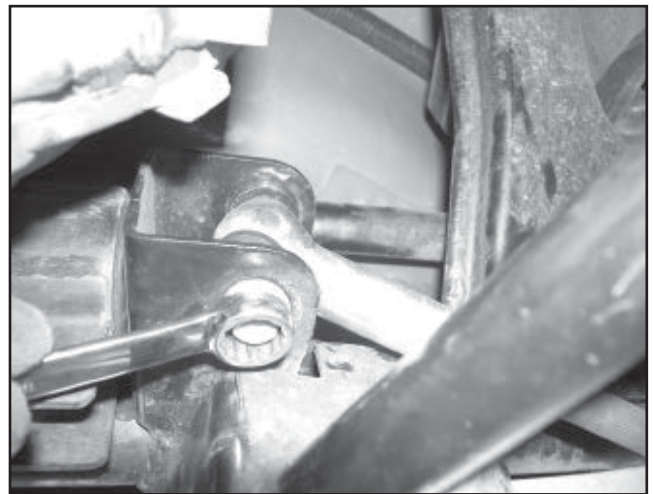


19. Repeat steps 14-18 for the other side.
20. Mark the orientation of the drive shaft flange to the pinion flange.

21. Remove the four bolts retaining the drive shaft to the pinion flange. It may be helpful to place the car in first gear to stop the drive shaft from rotating, or place a pry bar through the U-joint.
22. Using safety wire, secure the drive shaft to the parking brake cable bracket, located slightly forward of the rear bulkhead. AVOID removing the drive shaft; doing so will allow oil to drain from around the output shaft of the transmission.

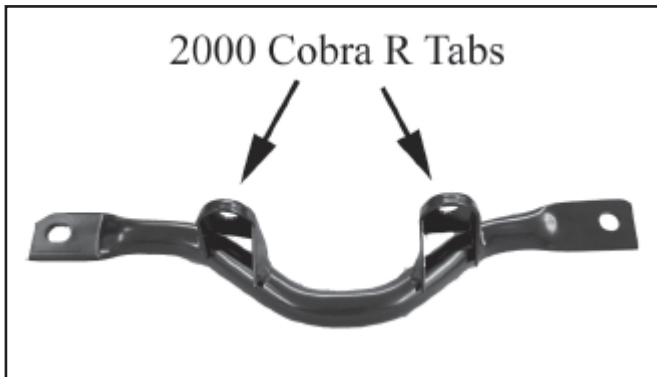


23. Unbolt the ABS sensors from each side of the differential housing. These attachment bolts have a head with both an external hex and an internal Torx.
24. Remove the driver side tie-rod from the IRS sub frame to allow access to the rear differential bushing bolt. On 2003-04 subframes, note that there is a spacer washer placed above the inner tie-rod end.



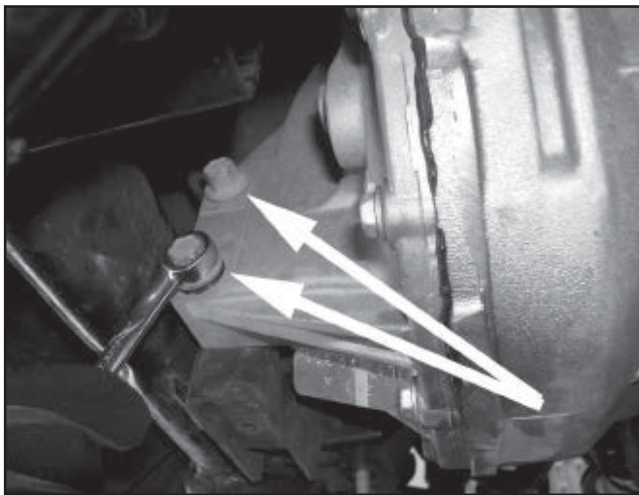
NOTE: Before proceeding, measure the pinion angle and the engine angle as described in the Pinion Angle Addendum Sheet.

NOTE: If your car has the 2000 Cobra R Differential Crossmember, or is a 2003-04 Cobra that came equipped with the 2000 Cobra R Crossmember, skip to Step 40. It can be identified by the mounting tabs indicated in the photo below.

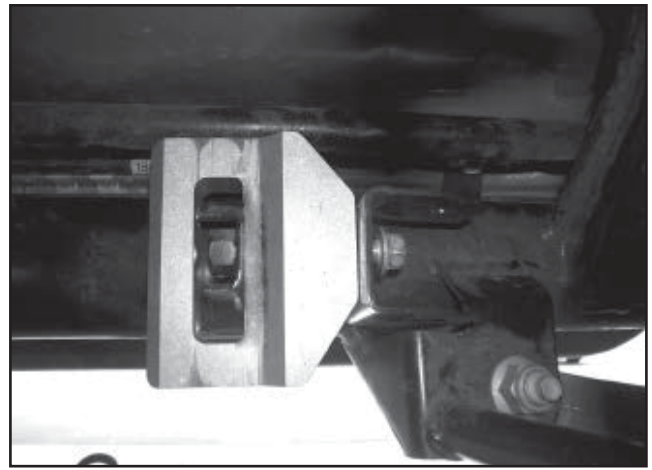


Vehicles without a Cobra R Crossmember

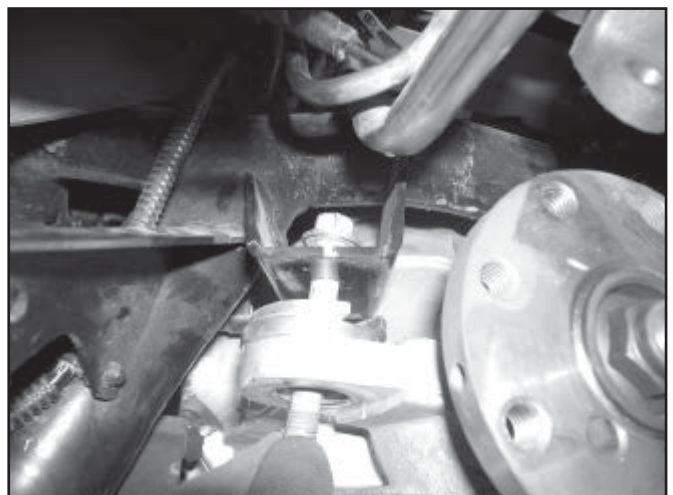
25. Support the differential with a floor jack.
26. Remove the two mounting bolts, located on the differential cover, that attach the cover to the rearward differential bushing.



27. Remove the two mounting bolts that secure the forward differential mounting flanges to the IRS subframe, along with the vibration damper and stock bushings.
28. Lower the Differential to the ground using the floor jack. This step may require an extra person to help secure the differential as it is lowered.
29. Unbolt the stock rearward differential bushing from the IRS subframe and remove.
30. Place the new aluminum MM Rear Differential Mount in the stock mounting location on the IRS subframe and insert the factory bolt. Snug the bolt until the bushing is just able to rotate.



31. Raise the differential back into the vehicle, leaving a gap between the forward differential mounting flanges and the IRS subframe.
32. Secure the aluminum MM Rear Differential Mount to the differential cover using the two factory bolts.
33. Torque the bolts to 76 ft-lb.
34. Place one spherical washer set (shown below), between each of the forward differential mounting flanges and the IRS sub frame. The Concave Washer should rest on the differential as shown in the picture. The slotted Convex Washer should be inserted so that the slot opening faces the front of the vehicle. Install the original mounting bolts from the top of the sub frame.

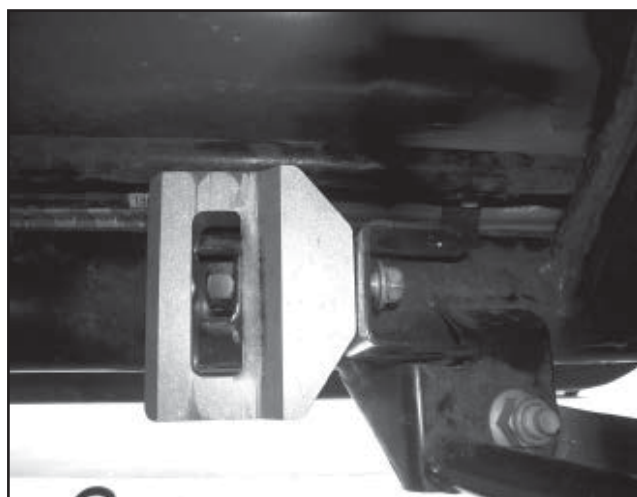


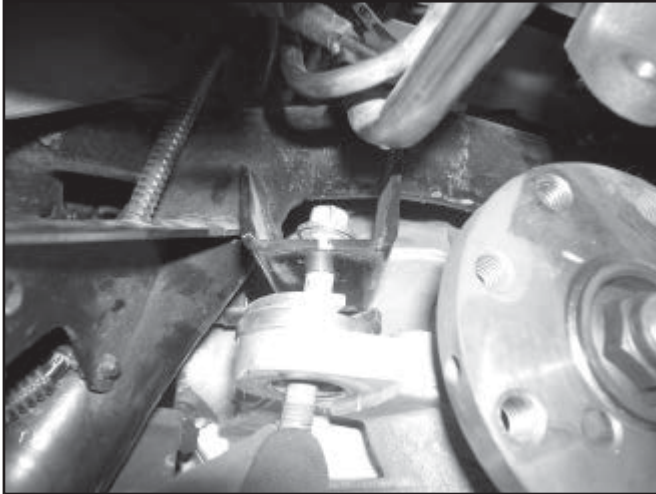
35. Jack the differential up until the front flanges are firmly seated against spherical washers.
36. Place the second set of spherical washers below the forward differential mounting flanges. The slotted Convex Washer must be placed against the forward differential mounting flange with the slot opening facing the rear of the vehicle.
37. Place two of the supplied aluminum Front Differential Mount Spacers below each of the lower spherical washers.
38. Place three Steel Shim Spacers below each of the previously installed aluminum spacers.
39. Install the nuts for the forward differential mounting bolts. Proceed to Step 62.
40. Remove the two nuts holding the differential crossmember/lower control arm forward mounting bolts to the vehicle.
41. Remove the two mounting bolts that secure the forward differential mounting flanges to the IRS subframe.
42. Support the differential with a floor jack.
43. Use a spring compressor to compress the spring on the driver side of the vehicle. The spring does not need to be removed from the vehicle, but the spring must be compressed to reduce the pressure on the differential cross member/lower control arm pivot bolt. Then, slowly pull out the mounting bolt so that only a 1/4" extends past the differential cross member. Release the spring compressor. DO NOT completely remove the bolt as the spring will still be under compression and damage to the IRS may occur.
44. Repeat step 43 for the passenger side.
45. Remove the differential crossmember from the vehicle.
46. Remove the vibration damper along with the stock front differential bushings.
47. Remove the two mounting bolts that hold the differential cover to the stock rearward differential bushing.
48. Lower the differential to the ground using the floor jack. This step may require an extra person to help secure the differential as it is lowered.
49. Unbolt the stock rearward differential bushing from the IRS subframe and remove.
50. Place the new aluminum MM Rear Differential Mount in the stock mounting location on the IRS subframe and insert the factory bolt. Snug the bolt until the mount is just able to rotate.

NOTE: The Steel Shim Spacers must be present between the nuts and the aluminum Front Differential Mount Spacers.

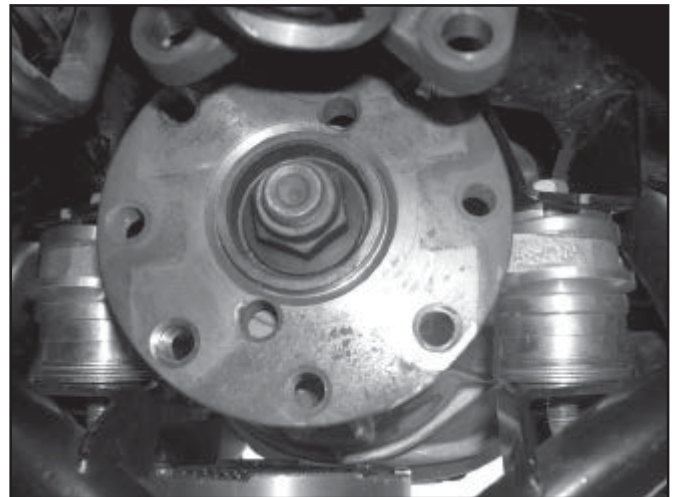
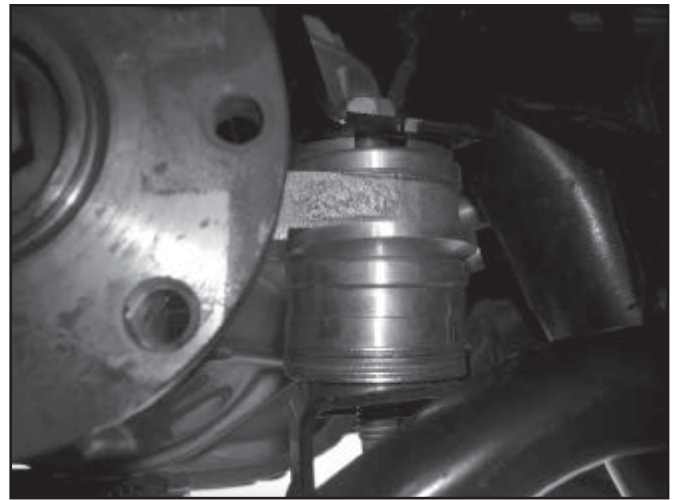
Vehicles with a Cobra R Crossmember

40. Remove the two nuts holding the differential crossmember/lower control arm forward mounting bolts to the vehicle.
41. Remove the two mounting bolts that secure the forward differential mounting flanges to the IRS subframe.
42. Support the differential with a floor jack.
43. Use a spring compressor to compress the spring on the driver side of the vehicle. The spring does not need to be removed from the vehicle, but the spring must be compressed to reduce the pressure on the differential cross member/lower control arm pivot bolt. Then, slowly pull out the mounting bolt so that only a 1/4" extends past the differential cross member. Release the spring compressor. DO NOT completely remove the bolt as the spring will still be under compression and damage to the IRS may occur.
44. Repeat step 43 for the passenger side.
45. Remove the differential crossmember from the vehicle.
51. Raise the differential back into the vehicle, leaving a gap between the forward differential mounting flanges and the IRS subframe.
52. Secure the aluminum MM Rear Differential Mount to the differential cover using the two factory bolts.
53. Torque the bolts to 76 ft-lb.
54. Place one spherical washer set (shown below), between each of the forward differential mounting flanges and the IRS sub frame. The Concave Washer should rest on the differential as shown in the picture below and on the following page. The slotted Convex Washer should be inserted so that the slot opening faces the front of the vehicle. Install the original mounting bolts from the top of the sub frame.





55. Jack the differential up until the front flanges are firmly seated against spherical washers.
56. Install the differential crossmember into the vehicle.
57. Identical to the removal procedure for the differential crossmember, use a spring compressor to compress the spring on the passenger side of the vehicle. Then, push the mounting bolt back in, being sure that it passes through the differential crossmember mounting hole. Release the spring compressor and repeat on the driver side of the vehicle.
58. Install the nuts on to the lower control arm/differential crossmember mounting bolts, but do not tighten at this time.
59. Place the second set of spherical washers below the forward differential mounting flanges. The slotted Convex Washer must be placed against the forward differential mounting flange with the slot opening facing the rear of the vehicle.
60. Using the provided aluminum Front Differential Mount Spacers and Steel Shim Spacers, minimize the gap between the lower spherical washers and the differential crossmember mounting tabs until no more spacers can be inserted.



NOTE: At least one Steel Shim Spacer must be present between each differential crossmember mounting tab and the installed aluminum Front Differential Mount Spacers.

61. Install the forward differential mount bolts from the top, down through the spherical washer/spacer stack. Thread the nuts onto the bolts and snug them down.
62. Remove the floor jack from underneath the differential.
63. Torque the forward differential mounting bolts to 52 ft-lb.
64. Torque the aluminum MM rearward differential bushing-to-IRS subframe bolt to 76 ft-lb.

NOTE: Refer to the Pinion Angle Addendum Sheet for directions on how to adjust the pinion angle before proceeding to Step 65.

65. Reinstall the ABS sensors onto the differential housing. Torque the Torx bolts to 5 ft-lb.
66. Connect the drive shaft to the differential. Use the mark made in Step 20 to correctly orient the drive shaft. Torque the bolts to 83 ft-lb.
67. Use a floor jack to support the passenger side lower control arm and remove the lower shock-mounting bolt. DO NOT allow the control arm to rest on the sub frame; the coil spring is still exerting significant force, and damage to the control arm may result.
68. Remove the tape covering the differential half-shaft input hole.
69. Install the axle half-shaft/spindle assembly. Insert the half-shaft into the differential. Take care to avoid damage to the differential seal. Make sure the circlip is seated, securing the half shaft in place. Install the upper spindle-to-control-arm mounting bolt.
70. Remount the lower shock bolt and torque to 98 ft-lb.
71. Lower the floor jack.
72. Double-check to make sure the internal circlip is engaged by pulling on the axle half-shaft inner CV joints; no movement should occur.
73. Install the lower spindle mounting bolts and torque to 85 ft-lb.
74. Repeat Steps 67-73 for the driver side.
75. Use the marks previously made on the eccentric cam alignment bolts to realign them. Torque the bolts to 66 ft-lb.
76. Install driver side inner tie-rod and mounting hardware to the IRS subframe. Torque the bolt to 35 ft-lb. On 2003-04 subframes, make sure the spacer washer is correctly placed above the inner tie-rod end.
77. Reinstall the brake calipers and rotors. Torque the caliper mounting bolts to 76 ft-lb.
78. Reinstall the parking brake cable and retaining clip.
79. Reinstall the parking brake cable holder to the lower control arm and torque the bolt to 9 ft-lb.
80. Reinstall the outer tie-rod ends. Stock outer tie-rod ends should have the nuts torqued to 35 ft-lb.

NOTE: If an MMIRSTR-1 adjustable tie-rod end kit has been installed to correct bumpsteer, a different torque value is required. If the tapered stud was removed, torque the 1/2-13 lock nut to 50 ft-lb. If the tie-rod end was removed from the stud, replace the tie-rod spacer stack as it was before removal, and torque the 5/8-18 lock nut to 65 ft-lb.
81. Reinstall the cotter pins if you are using the stock tie-rods.
82. If the lower control arm/differential cross member mounting bolts were not loosened during the bushing installation, proceed to Step 84.
83. Vehicles equipped with Delrin, urethane, or rod ends as bushing material may torque the bolts to 184 ft-lb and proceed to Step 84. However, if the bolts were loosened and the vehicle has the stock rubber lower control arm bushings, the vehicle suspension must be compressed and placed at normal ride height. After doing so, torque the bolts to 184 ft-lb.

NOTE: A significant amount of preload will be placed on the stock rubber lower control arm bushings if the lower control arm/differential crossmember mounting bolts are tightened with the suspension at full droop. This can lead to premature failure of the bushings as well as reduce the handling capability of the vehicle.
84. Reinstall the exhaust system and torque the exhaust flange bolts to 34 ft-lb.
85. Reinstall the rear wheels and torque the lug nuts to the manufacturer's specifications.
86. Safely lower vehicle to the ground and test drive.

This kit includes:

- 1 Rear Differential Mount, IRS
- 4 Spherical Washer, Convex, Aluminum
- 4 Spherical Washer, Concave, Aluminum
- 4 Front Differential Mount Spacers, Aluminum
- 18 1/2 ID x 2 OD Steel Shim Spacer

Cobra IRS Pinion Angle Addendum Sheet

Measuring Pinion Angle:

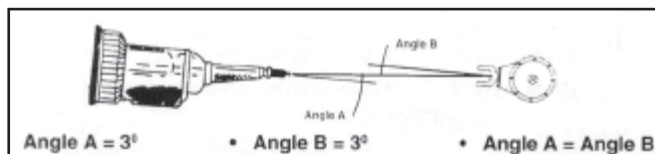
NOTE: It is not necessary for the car to be level to measure and adjust the pinion angle. What is important is the angle of the pinion relative to the angle of the engine/transmission.

Measuring the pinion angle is done using an angle finder. Inexpensive angle finders are commonly available at most hardware stores. To measure the pinion angle, place a straightedge, vertically, against the driveshaft mounting flange of the differential. While this can be done most easily after the driveshaft has been removed, it is possible to do with the driveshaft in place. Place the angle finder against the straightedge, and note the angle indicated. The angle of the pinion is 90 degrees away from the angle of the mounting flange. For example, if the car is level, the angle of the differential flange will usually measure 1 degree away from being plumb (away from being perfectly vertical). The pinion angle will then be 90 degrees away from that, or 1 degree (usually down). In other words, in this example, the nose of the differential is pointed downwards, towards the ground, rather than pointed upwards.

Measure the angle of the engine/transmission. This can be done most easily by placing a straightedge, vertically, against the front crankshaft pulley. Just as with the rear driveshaft flange, place the angle finder against the straightedge, and note the angle indicated. The angle of the engine is 90 degrees away from the angle of the front crankshaft pulley. For example, if the car is level, the angle of the crankshaft pulley will usually measure 3 degrees away from being plumb (away from being perfectly vertical). The engine angle will then be 90 degrees away from that, or 3 degrees (always up). In other words, in this example, the engine is pointed upwards, at the front, by 3 degrees. When measuring these angles be as accurate as possible. A variance of even .5 of a degree can make a difference in driveline vibrations.

Using Shim Washers To Adjust Pinion Angle:

MM recommends that the pinion angle be adjusted to match the engine angle as closely as possible to minimize driveline vibrations.



The pinion angle can be adjusted by changing the position of the supplied Steel Shim Spacers. The spacer stack must remain the same size, but by changing the relative position of the differential mounting flanges within the stack, the pinion angle can be changed. As per the installation instructions, the spacer stack is currently holding the differential in the highest position, and therefore the greatest pinion angle upwards. To reduce the pinion angle, remove the 2 forward differential mounting bolts, and move Steel Shim Spacers from below the differential mounting flanges to above. Make sure to keep the spacer stack the same on each side. Each Steel Shim Spacer will change the pinion angle by about 1/4-degree. If a larger reduction of the pinion angle is required, one or more of the thick aluminum Front Differential Mount Spacers may be moved to above the differential mounting flanges. Moving one aluminum Front Differential Mount Spacer will lower the pinion angle by about 1-1/4 degrees. DO NOT move the spherical washers.

When re-assembling, make sure that the spherical washers are aligned properly as detailed in the instructions (Step 34 or Step 54) before tightening the bolts. Measure the pinion angle again after making changes to the spacer stack. Repeat the process if necessary.