AMERICAN EXPEDITION VEHICLES

# AEV-Nth JK Suspension Systems
# **Installation Instructions**


## 3.5” and 4.5” Suspension Systems designed for:

2007-current Jeep JK Wrangler and Unlimited models in all trim levels including Rubicon

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| **Vehicle Applications** | '07-current Jeep JK Wrangler and Unlimited all trim levels including Rubicon |
| **Assumptions** Equipment that must already be present on your Wrangler | Stock JK frame and axles with all stock brackets intact |
| | Stock Exhaust - or equivalent position for clearance both where it crosses below the front driveshaft and over the rear track bar. |
| | Stock Front and Rear Driveshafts: Note1: *aftermarket units with double-Cardan joints will require a rear axle pinion angle adjustment that is <u>not</u> provided in these systems.* Note2: A small-diameter front driveshaft is recommended for clearance on 4.5" systems and all vehicles with automatic transmissions. |
| | Aftermarket Wheels – these are recommended both for adequate width to mount large tires and decreased backspacing for chassis & steering clearance. <u>NOTE</u>: JK X-model factory 16-inch wheels will *not clear* the new drag-link included in all Premium Suspension Systems. Any AEV JK wheel will solve the clearance issue or a set of 1.0" thick wheel spacers with your stock wheels. NOTE2: Wheels with extremely negative offset may negatively affect ESP (stability control) function. |
| **Required Tools and Equipment** (in addition to common hand tools) | 7/8" drill bit for metal & high-torque drill motor |
| | Floor jack and two jack stands (or vehicle lift with tall jackstands) |
| | Metal cutting tools (several options – see step 9) |
| | Torque Wrench (ft-lbs) |
| **Install Time (est.)** | Home/DIY/Shop 1st install: 10-12 man-hrs; Shop 2nd or later install: 7-8 man-hrs |

*Please take the time to read these instructions – they are long because we want you to get the installation right the first time and enjoy the product immediately thereafter!* Do not start or attempt this product installation if you are unsure of your abilities or do not have the resources listed above. Be sure to check/set all specified torques with a torque wrench…too tight is not just right!!

**Step 1**: <u>Unpack boxes</u> Check contents against packing list; Verify parts are in good condition.

**Step 2**: <u>Read</u> all of the following instruction steps before beginning. Do not disassemble vehicle unless all parts are present and all tools and facilities required are available.

## FRONT SUSPENSION

NOTE: Be sure to save all removed hardware and keep it associated with the location on the Jeep where it came from – *nearly all of it will be reused*.

**Step 3:** <u>Remove Stock Parts.</u> Place the front portion of the frame on jackstands or use a vehicle lift that supports the frame directly. Also support the front axle with a floor jack or jack stands, then lower the axle or raise the Jeep/frame and remove the following parts:

- front wheels/tires
- springs
- shocks
- front stabilizer end links[1]
- steering drag link (coupler to knuckle portion only)
- steering damper
- Trans Skid plate (autos only)[2]
- <u>Rear</u> Stabilizer End Links[3]

**NOTES:**

[1] Be sure to keep the nuts for the upper-end studs matched to the links because they are NOT the same thread as the bottom-end bolts or the shock lower-end bolts!
[2] *CAUTION*: To avoid damage to the (expensive!) front driveshaft, remove this skid prior to lifting the vehicle – *do not allow it to contact the driveshaft*! The weight of the front axle is enough to damage the driveshaft if it contacts this skid - resulting in vibration issues and/or shortened driveshaft service life. Also, this skid *cannot be reinstalled* with the lift – do not attempt to do so even though it seems to fit when the Jeep is sitting on the ground.
[3] The rear stabilizer end links will be reused on the front suspension with this system.

Also perform the following items only as indicated (not full removal as above):

- Disconnect front track bar @ axle end.
- Detach brake hoses @ frame (remove retainer bolts only, do not open the hydraulics!).
- Loosen all upper and lower control arm bolts.

*CAUTION*: Be sure to watch out for the wheelspeed sensor wires that run to each wheel (along the brake hoses) and make sure to not overextend or otherwise damage them.

**Step 4**: Install Brake Line Drop Brackets. Determine which of the four supplied brackets is for each corner of the vehicle and install the fronts to the frame using the bolt that was originally holding the brake line. Using your hands, gently alter the existing bends in the hard lines so they will reach down to the new brackets, then use the supplied ¼" bolts and nuts to secure the brake lines to the brackets. **Figure 4-1** shows the left front installed and the inner plastic wheelwell pulled back to show how the brake lines have been re-bent. Additionally on the front brake lines, you will need to also 'open up' the bend on the upper end of the hose as shown in **figures 4-2 and 4-3** so there will be enough length for full travel.


4-1


4-2


4-3

**Step 5**: Install Bump Stop Spacers and Springs. Locate and drill a 3/8" hole in the center of each strike surface in the middle of the spring seats on the axle (see **figure 5-1** next page). Before placing the springs in the vehicle, you will need to insert one 3"dia. X 3"tall spacer inside the spring from the bottom end with the counterbored side facing up, then you will bolt the spacer to the drilled hole in the axle after the spring+spacer is placed. Position the spring's upper pigtail around the jounce tower on the frame and raise until the bottom end of the spring can fit over the axle seat – making sure to keep the spacer inside the spring. Once the spring is in place, use the provided bolts, nuts, and washers to secure the bumpstop to the drilled hole as shown in **figure 5-2**. Tighten to 30 ft-lbs and repeat for the other side.


5-1


5-2

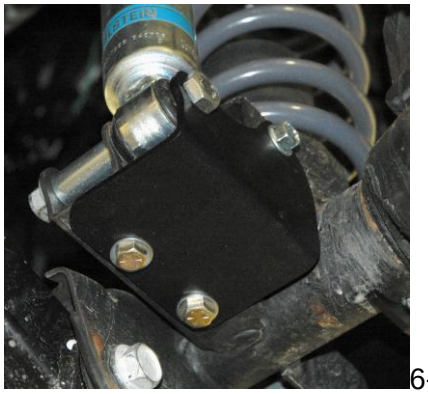

5-3

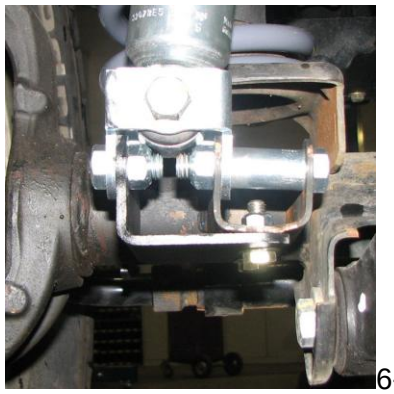
**NOTE:** If this suspension is being installed in conjunction with an AEV Hemi conversion, a pair of white (or black) plastic shim rings are included with the Hemi kit and should be installed before the springs. To do so, remove the rubber isolator from the spring tower on the frame, place the shim above it as shown in **figure 5-3**, and reinstall the isolator. Repeat for the other side.

**Step 6**: Install New Front Shocks. Install the upper stud-type bushing end of the shocks to the frame mounting points in the same manner as the originals were removed. To keep the shock rod from spinning, use a 5mm hex key ('Allen' wrench) in the end of the stud and use an open end wrench to turn the nut. Be sure to only compress the bushings by approximately 1/8".

Especially for Premium Systems, the lower end of the front shocks must be spaced outboard of the stock brackets to keep them from hitting the frame during extreme articulation. To do this properly, you have a separate pack that includes pair of 'doubler brackets' and hardware (Nth99053Ax) that will preserve the double-shear mounting arrangement with the shocks outboard of the stock bracket. Match each bracket to the correct side and install as shown in **figure 6-1** which shows the passenger side. Note that the bottom bolt locations fit to existing holes in the stock brackets, but the forward one on the right side may not exist and require drilling the stock bracket. For the side of the spring seat, use the self-tapping bolts supplied and drive them in with an air-ratchet, then add a nut to the backside for good measure.

For +3.5" and most +4.5" systems, complete the shock connection using the supplied spacer tubes and longer M12 bolts as shown. If yours is a +4.5" system, you were also supplied to with an additional hardware pack (Nth99051Az = JK Shock Spacer Kit) that can be used to optimize the travel of the supplied shocks for your 4.5" system – however, *you may only use this kit if you have replaced your front driveshaft with an aftermarket unit with smaller tube diameter*. (Note that this hardware pack also includes four tubes and longer metric bolts to space the rear shocks as well – these are addressed later in the instructions).


6-1


6-2


7-1

To install shock spacers for 4.5" systems, attach one square 'extender' bracket to each doubler installed above using the new bolts and tubes supplied (i.e. you will not use the long metric bolts and longer tubes supplied in the doubler bracket pack). Arrange the bolts and 1.375" long tube as shown in **figure 6-2** – this is done to provide clearance to avoid static contact with the shock eye. Add the shock to the extender by turning the shock body/lower-eye 90 degrees and re-using the stock shock bolt.

**Step 7**: Install Driver's Front Axle Bracket. For premium systems, find the smallest of the three brackets; for standard systems use one of the two identical brackets you received. This bracket is used solely to provide a higher attachment point for the stabilizer end link. Install the bracket to the inboard side of the stock axle tab as shown in **figure 7-1**. Secure the bracket using a supplied ½" x 1.0"L bolt, nut, and washer.

For standard +3.5" systems, repeat this with the second bracket on the passenger-side axle tab, again making sure the bracket is inboard of the tab. Note that the direction of the bent flange on the front of the bracket is irrelevant and does not need to be a 'mirror image' of the driver's-side bracket.

**Step 8**: Install Passenger-Side Front Axle Brackets (*Premium Systems only*). Refer to **figures 8-1 and 8-2** for illustration of this step when completed. Of the two remaining brackets, one has 'half moon' cutouts to fit over the axle tube. Place this bracket inside the original front track bar bracket and over the axle tube. Insert two of the supplied 3/6" x 1.0"L bolts through the small holes in the bracket and the corresponding holes in the stock bracket, then add washers and nuts and run them up snug, but do not tighten yet. Next, add the supplied u-bolt, nuts, and washers and tighten to 25 ft-lbs. Finally, tighten the two bolts to 35 ft-lbs.


8-1


8-2

Next, place the spacer tube from the front high-steer kit hardware pack inside the stock trackbar bracket in front of the new bracket and line it up with the original track bar bolt hole – this may require slight prying or tapping with a hammer. (note this tube is not shown in the pictures).

Now place the remaining bracket in front of the stock track bar bracket on the axle and line up the small holes with the corresponding ones on the axle bracket. Insert the remaining two 3/8" x 1.0"L bolts from the front through the brackets and add washers and nuts (the outboard nut is accessible from below). Run the nuts up snug but do not tighten them yet. Place the remaining ½' x 1.0"L bolt through the stock stabilizer tab and corresponding bracket hole and add the locking nut, then tighten it to 50 ft-lbs. Now tighten the two smaller bolts to 35 ft-lbs and finally insert the original track bar bolt from the front and add the original flag nut to the rear but leave loose for now.

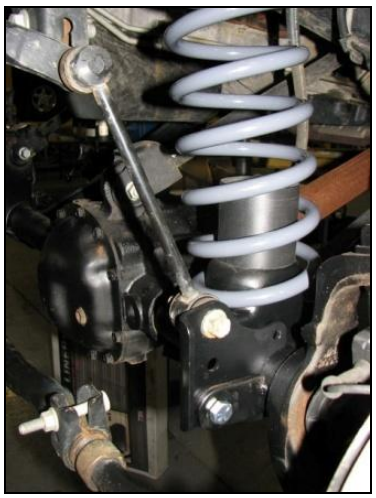
**Step 9**: Install High-Steer Draglink (*Premium Systems only*). First, drill out the tapered hole in upper (draglink) arm on the passenger knuckle to make it 7/8" diameter straight hole as shown in **figure 10-1**. *Be sure to drill as straight and steady as possible to avoid a loose connection!* Insert the supplied taper-to-straight adapter sleeve into the hole as shown in **figure 10-2**.

10-1

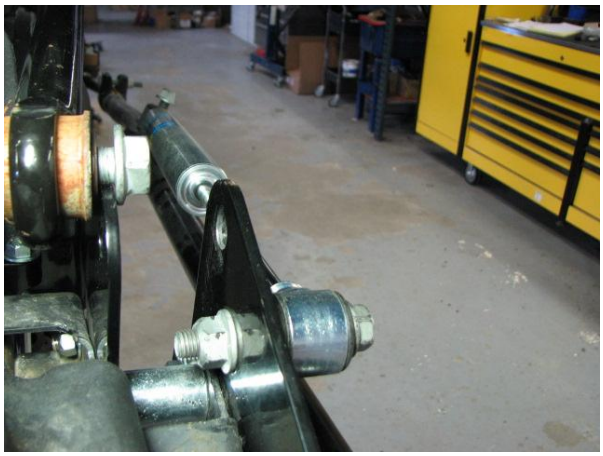
10-2

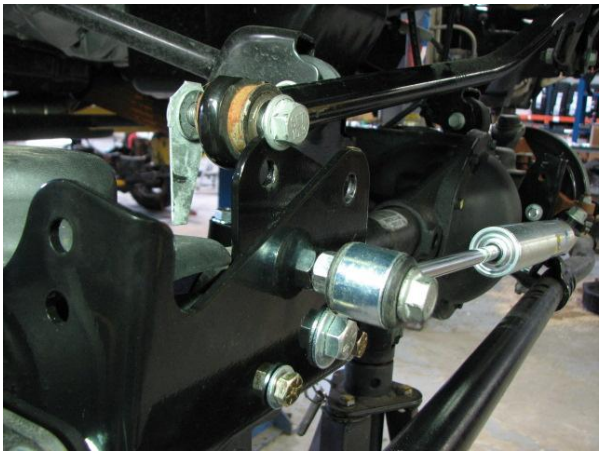
Next apply anti-seize compound to the threads of the new draglink and thread it into the adjuster sleeve until the amount of thread showing is similar to the amount showing on the short side that is still attached to the pitman arm. Now insert the tie rod end of the draglink into the adapter sleeve, but do NOT use the original TRE nut. Instead, use the new flange lock nut provided in your kit. This is necessary because the new nut has a larger flange that can adequately cover the 7/8" hole.

**Step 10**: Install Rear Stabilizer End Links at Front Locations. For each side attach the upper end stud to the stabilizer bar in the same manner as the original front links had been (nut on frame side of bar). *Reminder*: As mentioned earlier, the upper stud has a different thread than the rest of the M12 fasteners in the suspension – it is a 'normal' pitch versus the rest which are 'fine pitch'. Tighten to 40 ft-lbs. The lower ends of the links will attach to the inboard side of the new brackets on the axle using the original hardware. Use the top hole in the bracket for both 4.5" and 3.5" systems.


11-1

**Step 11**: **<u>Install New Steering Damper.</u>** Refer to the figures below for the new damper's attachment arrangement. Loosen the clamp that holds the factory steering damper mount to the tie rod and slide it toward the driver's side several inches (out of the way for now). Place the eye of the damper body onto the stud on the tie rod bracket and add the original nut and tighten. To attach the damper to the new High Steer axle bracket, use a factory lower shock absorber bolt removed earlier and insert it through the eye and add the plain non locking nut provided in the hardware kit as shown. Tighten to 40 ft-lbs. Now insert the remaining length into the open hole in the new High Steer bracket between the new and old track bar bolts. Add the factory lower shock mounting flange nut and tighten. NOTE: Turn the locking nut while holding the bolt stationary. To position the bracket on the tie rod properly, extend or compress the damper until the eye to eye length is 16.5 inches. Next make sure the steering is straight ahead. You will have to estimate this by eye since the wheels are off and the steering hasn't been centered yet, but this will be sufficient for this step. Now rotate the bracket around the tie rod until the stud is pointing just rearward of straight up while the tie rod itself is rocked "down" as far as it will go. Tighten the mounting bracket at this position. The final installation should look similar to the photos below.





**Step 12**: Reattach Track Bar. Raise the axle until the axle-end of the track bar can be lined up with the uppermost holes in the new brackets. It may be necessary to pry the brackets apart to allow the track bar to drop in easily. Add the supplied 9/16" or M14 bolt and locking nut, but do not tighten at this time – the final appearance can be seen in figure 12-1 above.

The front suspension is now complete except for final adjustments and torques, which will be performed at the end. You may now reinstall the new front wheels/tires and if not using a vehicle lift, you may remove the jackstands and let the front rest on the tires.

## REAR SUSPENSION

NOTE: Be sure to save all removed hardware and keep it associated with the location on the Jeep where it came from – all of it will be reused.

**Step 13:** Remove Stock Parts. Place the rear of the frame on jackstands or you may already be using a vehicle lift that supports the frame directly. Also support the rear axle with a floor jack or jack stands, then lower the axle or raise the Jeep/frame and remove the following parts:

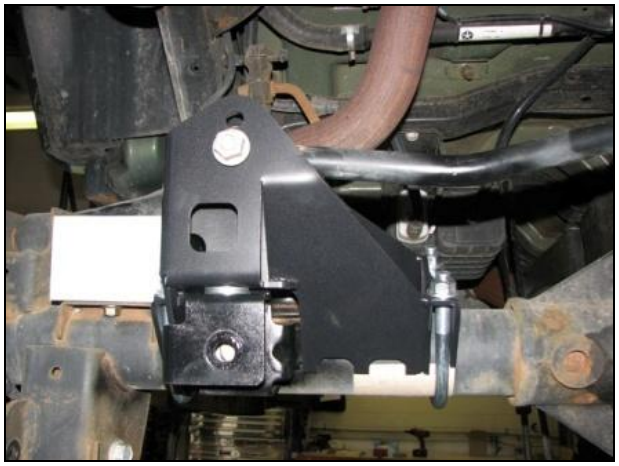
- rear wheels/tires
- springs
- shocks
- track bar
- park brake cable wireform @ floor

Also do the following items only as indicated (not total removal as above)

- Detach brake hoses @ frame (remove retainer bolts only, do not open the hydraulics).
- Detach park brake cables @ axle ends.
- Detach axle breather hose @ axle.
- Loosen all upper and lower control arm bolts.

**Step 14**: Brake Line Drop Brackets. Similar to the front drop brackets, identify the left and right brackets and install them to the frame using the original hardware, then gently bend the brake lines down and reattach them using the remainder of the ¼" hardware provided.

**Step 15**: Install Rear Track Bar and Tower. Refer to **figure 16-1** as illustration of the completion of this step for a +3.5" installation. Place the tower over the axle and on top of the factory track bar bracket. Adjust the position so that the outboard flange of the bracket is flush against the outboard side of the stock bracket. Use a marking pencil to trace the outline of the oval hole of the tower onto the top side of the stock bracket. Remove the bracket, center punch in the middle of the marked oval, and drill a ½" hole.


16-1

Replace the bracket and place two large-diameter washers between the tower and the drilled hole, then connect using the supplied bolt, nut and two small-diameter washers, and tighten to 35 ft-lbs, making sure that the tower is fully seated to the axle tube and flush against the side of the stock bracket. Next place the other supplied bolt with a small diameter washer through the forward portion of the stock bracket and the tab of the tower. Use a small diameter washer and locking nut to finish the attachment. Tighten to 45 ft-lbs (61 N-m). Finally, add the two u-bolts and attach with small diameter washers and lock nuts. Tighten all four incrementally until all are at 40 ft-lbs.

Now install the replacement track bar with the new bend pointing 'down' (i.e. "V' shape) under the exhaust tailpipe. For +3.5" systems, use the lower hole in the tower; +4.5" systems use the upper hole. Note that both bolts must be inserted from the front of the vehicle to assure clearance to other components. The factory flag nut that was originally on the axle end can be discarded and replaced with the supplied M14 flange nut.

**Step 16**: Install Rear Bump Stop Spacers. ** These plastic spacer blocks are shown in white for illustrative purposes only – your actual parts should be black ** Each block contains two pairs of countersunk holes, and you should also have two sets of four flathead bolts that are 3.5" and 4.5" long. For +3.5" systems, place each block on the striker bracket on the axle (looks like a weak leaf spring perch) and line up the holes to allow use of the shorter bolts (i.e. 3" spacing thickness). Drop the bolts in from above and secure with the flanged nuts provided.

For +4.5" systems, place the blocks 'on edge' so that the holes for the longer bolts line up with the axle bracket holes. Make sure that the blocks are biased *inboard* – that is, more of their width is closer to the middle of the vehicle – for proper bump stop alignment. **Figure 17-1** shows the left-rear spacer from the front, while **figure 17-2** shows the same spacer from the rear.


17-1


17-2

**Step 17**: Reroute Park Brake Cables. The factory routes the park brake cables over the top of the crossmember that is just ahead of the rear axle. They were originally held in location by the wireform 'double pigtail' you removed in step 14, which will no longer be used. On 2-door models, this removing the wireform all that is required to provide sufficient length for use with the lift. On 4-door models you can reroute the cables below the frame crossmember and fuel filler tube by disconnecting their axle-ends, then secure the cables to the crossmember using the large zip-tie supplied (the black one shown in **Figure 18-1**)


18-1


19-1

**Step 18**: Install Rear Shocks and Springs. Start with the top of the shocks – they mount directly in place of the originals using the factory hardware. Next, place each rear spring with the small 'pigtail' end on the axle seat and the factory shallow-cone-shaped isolator balanced on top of each spring. It will be easiest if one person guides both springs into place while another raises the axle (or lowers the Jeep) until the springs just touch the frame and hold the isolators in place.

Now attach the bottom of the shocks to the stock mounting locations on the axle using the stock hardware. The completed installation of the springs should look like **figure 19-1**.

**Step 19**: Install New Stabilzer End Links. Install the new end links in the same position as the stock links as shown in **figure 20-1**. In the upper mounting location you will re-use the factory flange nut. In the lower mounting location you will re-use the factory bolt and flange nut (positioned going inboard) plus the supplied large diameter washer. The washer should be placed between the bolt head and the end link bushing. Torque the upper nut to 65 ft-lbs (88 N-m) and the lower bolt to 40 ft-lbs (54 N-m).
**NOTE: If the end links contact the wheel you must reverse the position of the end links so that they are on the inboard side of the stabilizer bar ends and axle tab as shown in figure 20-2.**

20-1

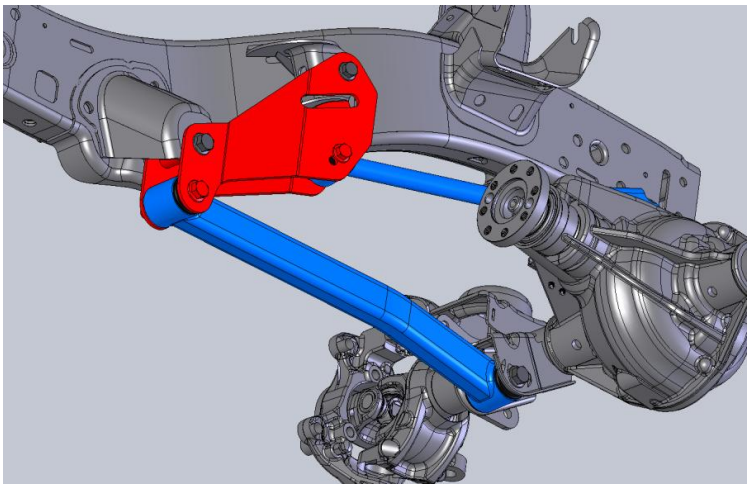
20-2

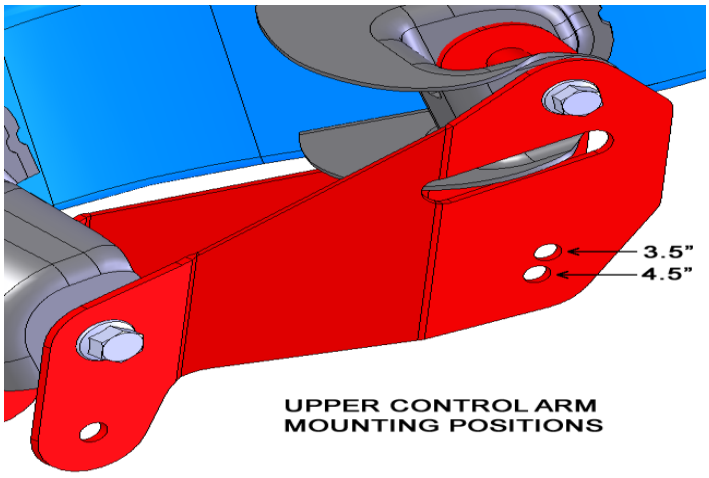
**Step 20**: Reroute Rear Axle Vent Hose. To compensate for the added distance between the frame and axle due to the new 'lift height', the hose can be rerouted to avoid overextending it. Pull the hose out of its clip on the frame and pull it off from above the spring seat on the frame by pulling on it from outboard of the passenger frame rail. Now run the hose through the small gap in the corner of the right-rear shock bracket and back down to the fitting on the axle. Your new routing should look like **figure 21-1**

21-1

The rear (and overall) suspension installation is now complete except for final adjustments and torques. You may now reinstall the new rear wheels/tires and if not using a vehicle lift, you may remove the jackstands and let the Jeep rest on all four tires.

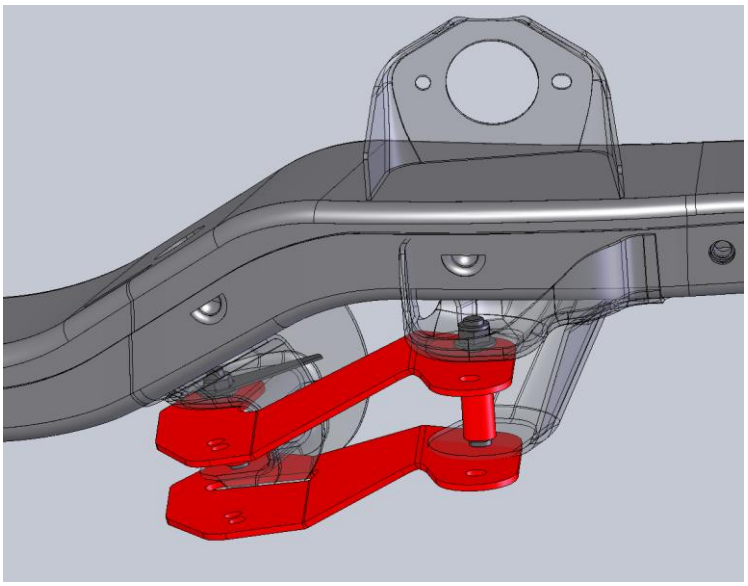
**Step 21**: **Install Front Control Arm Drop Brackets:** **This installation is best performed with all four wheels on the ground.** Remove upper and lower control arm bolts at frame end and save the factory hardware. Install the brackets as shown with the factory hardware using the supplied spacers in the original control arm mounting locations. Use the supplied hardware in the new (dropped) locations. **NOTE: There are two re-location holes in the brackets for the upper control arm mounting. If you are installing the AEV 3.5" Suspension, use the UPPER hole (less drop), and if installing the AEV 4.5" suspension use the LOWER hole (more drop) as shown in the illustration below**

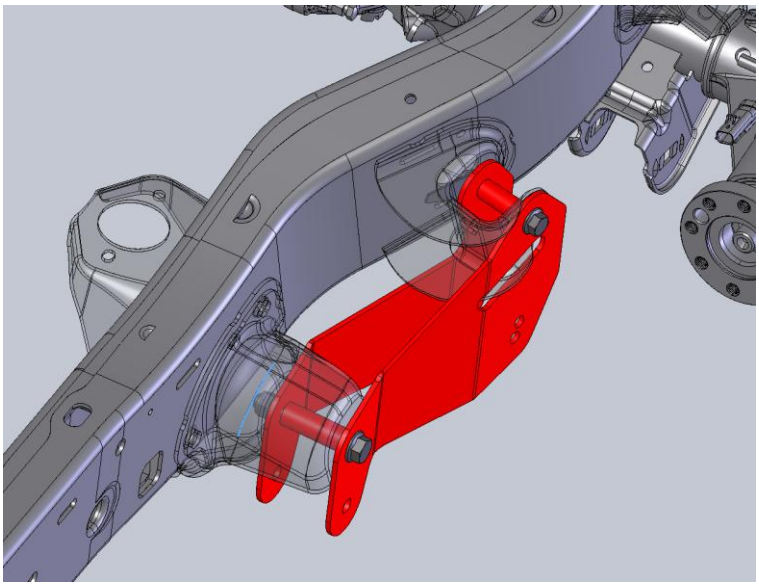


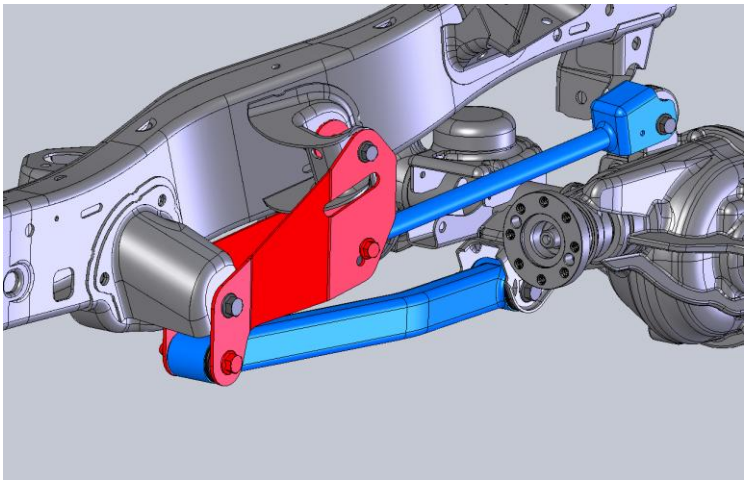


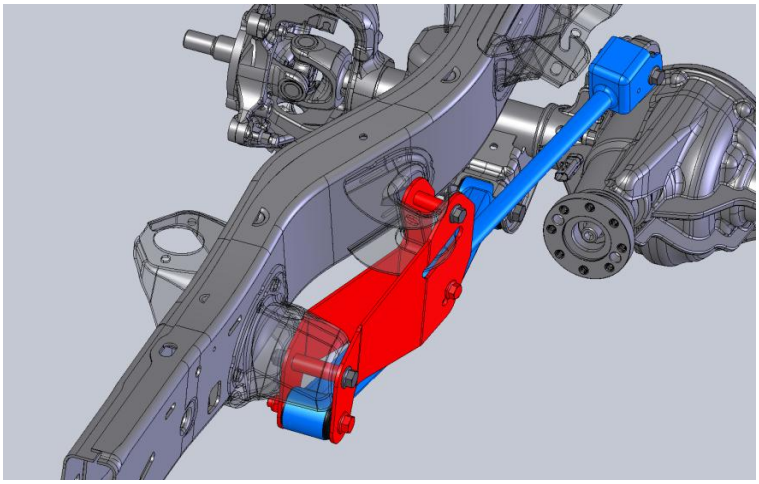

**IMPORTANT: If cam bolts were previously installed on the vehicle, remove them and discard. Use new M14 hardware provided to replace the cam bolts.**

Torque the lower (m14) bolts to 125ft-lbs and the upper (m12) bolts to 75 ft-lbs.









## COMPLETION

**Step 22**: Adjustments and ProCal. Assuming the Jeep was properly aligned prior to the suspension installation, there are only two alignment parameters that have been altered and need to be adjusted: caster and steering wheel center. If your system included the AEV JK Programmer, you may use it to accurately center the steering wheel by following the separate instructions provided with it.

Ideal caster for 35-37" tires with either the 3.5" or 4.5" systems is 5 degrees. If step 9 was performed correctly, you should automatically have about 5°+/-0.5° and not need professional adjustment using a machine. This setting should deliver good tracking and feel, but different tires and inflation pressure, road conditions, etc. can affect your results. If you experience tracking issues, you should double-check your toe settings plus tire inflation and balance and consider having a professional alignment done if problems persist.

**AEV ProCal**: Now that your suspension is physically installed along with your larger tires (and possibly regearing the axles), you should 'inform' your JK of these changes by use of the ProCal module (included with Premium systems and also available separately). On new all-electronic vehicles such as the JK, it is especially important to adjust tire diameter, axle ratio, and re-center the steering wheel to restore proper speedometer reading, auto transmission shift points, and ESP functions. Follow the separate ProCal instructions to perform these adjustments. If you cannot adjust these parameters at the time of installation, be aware of the discrepancies and performance issues will result and correct them as soon as possible.

**Step 23**: Final Torques. Now that the Jeep is fully assembled and sitting on its tires, you may re-torque all track bar and control arm bolts (upper and lower) to factory torque specs. *This must be done with the vehicle resting on the springs* to assure that there is no preload in the bushings which would cause a harsh ride and premature bushing failures. All other connections should already have been tightened, but now is a good time to confirm none were missed.

Also, it is good practice to mark each major bolted suspension connection such as these with a paint-pen – drawing a line that runs from the bolt head or (especially) nut to the adjacent bracket material as shown in **figure 23-1**. This will allow a visual inspection to easily catch bolts that work loose (or were never tight). After ~100 miles of driving, you should perform a complete visual inspection and re-torque any suspect bolts as well as your wheel lug nuts.


23-1