Installation Instructions: **Shock Shifter™ – TJ Wranglers**

Kit Part Number	**Nth23100AC**
Vehicle App's	'97-'06 Jeep TJ Wrangler and Unlimited models including Rubicon package
Assumptions Equipment that must already be present on your Wrangler	A factory/stock TJ axle housing (Dana 35 or 44) is being used. Kit can be used with other axle housings with minor trimming to fit larger axle tube diameters.
	The frame is unmodified in the area where the fuel tank crossmember meets the frame rails. (see notes in text regarding '97-'98 TJs)
	The shocks are made to fit a normal TJ application with bar-pin on top and 1-3/8" long inner metal sleeve in the lower bushing (correct size to fit stock TJ axle).
	** The shocks being used are an appropriate length for the amount of lift on the vehicle – or at least the proper amount of bumpstop spacing is in place to prevent the shock from being the suspension's up travel limiter (see warning last page).
Required Tools and Equipment (in addition to common hand tools)	15/16" deep socket or ratcheting wrench plus a normal 15/16" wrench or large crescent wrench.
	Floor jack and two jack stands (or vehicle lift with tall jackstands)
	Drill, bits, 3/8" transfer punch (optional)
	Plasma Cutter, Torch, or Sawzall (to remove stock shock brackets)
	Grinder/Sander (to smooth axle tubes and remove paint for welding)
	MIG Welder and related equipment plus a qualified operator
	Torque Wrench (ft-lbs)

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 below. If applicable, be sure to have all welding done by a certified person, and check/set all specified torques with a torque wrench…too tight is not just right!!

WARNING: Bump Stops vs. Shock Length. See the last page of these instructions to understand the consequences of improper rear suspension set-up…do *NOT* assume that your pre-packaged lift kit means you're automatically 'correct'! With the SS installed properly along with proper bumpstop spacing, shocks that fit when mounted in the stock locations will also fit when in the SS position and give roughly the same articulation.

Step 1: Unpack boxes; Check contents against packing list; Verify parts in good condition.

Step 2: Read 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.

Step 3: Remove Rear Shocks. The top bar pin bolts require a 13mm socket on a long extension, the lowers should be an 18mm nut on a 15mm hex-head bolt.

Step 4: Prepare to Install Frame Brackets. If the axle is still under the vehicle, it is necessary to remove the track bar to gain access for drilling the passenger-side hole (you may be able to get away with detaching only the frame end and pushing it out of the way). The axle should also be at full 'droop' to give better clearance for the drill (make sure vehicle is properly supported by jackstands.)

Step 5: Drill Frame Holes. Identify the left and right hand brackets (they cannot be installed backwards). Doing one side at a time, bolt the bracket to the frame using the original two shock bolts that had held the 'bar pin' originally. The bracket should extend forward and rest against the angled surface at the front edge of the frame crossmember (**figure 5-2**). You should drill the needed hole in the frame directly through the bracket while it is in place (be careful not to hit the underside of the body floor!). After the holes are drilled, use a sturdy Phillips-type screwdriver as a prybar by inserting it through the bracket/drilled-hole – push the handle of the screwdriver outboard (toward the tire) to push the body flange inboard so that it will not interfere with the bolt in the next step - after step 6 you should check with a flashlight to confirm that the end of the bolt is not touching the flange – else you will hear a high-pitched squeak from the rear of your Jeep while driving.

NOTE: Trimming required on 1997 TJs. If your TJ is a '97 model year, your trackbar bracket will require trimming before the SS upper bracket will fit properly. On early TJs, Jeep added an extra 'tie strap' across the inboard side of the main trackbar bracket as shown in **figure 5-1**...sometimes this bracket has a third weld to the underside of the frame crossmember (as shown), and sometimes not – either way it must be removed on 1997 TJs. 1998 TJs also have a strap, but it is smaller and does not weld to the frame crossmember – the SS was designed to fit without removing the strap on most 1998 TJs as long as the strap doesn't protrude more than ½" inboard of the inside surface of the frame rail (so you will have to measure on 1998's to determine if trimming is required). For the 1999 model year, Jeep eliminated this strap and has never used it since – indicating that Jeep decided it was redundant and unnecessary - so cutting it off to fit the SS will not compromise the structure of your early TJ. If necessary on your TJ, remove this strap before attempting to install the right-side SS upper bracket to the frame – *it will not fit otherwise.*

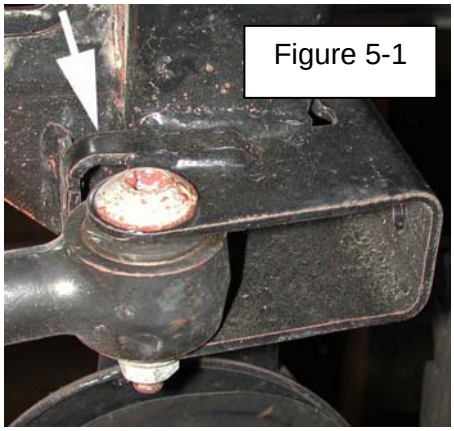


Figure 5-1


Figure 5-2

Step 6: Install Frame Brackets. To do the final install of each frame bracket, first install two of the supplied carriage-head bolts into the square holes of the bracket as shown in **figure 6-1**, then place the bracket in position and note where the forward carriage bolt contacts the frame. Use a ball-peen hammer to make a small dimple in this area to lessen the interference or take ~1/16" off the dome of the carriage bolt's head with a grinder/sander (not too much!) – but don't do either to the point where the bolt is loose – it should be 'trapped' between the bracket and frame when the bracket bolts are tight. For each side, reinstall the two original bar pin bolts and add the supplied 3/8" x 1.0" long bolt and metal lock-nuts through your drilled holes, then tighten. It will help to start the new 3/8" bolts *before* tightening the bar-pin bolts. **Figure 6-2** shows a completed passenger-side bracket from the inside looking outboard. Remember to check for clearance between the tips of the new bolts and the body flange.

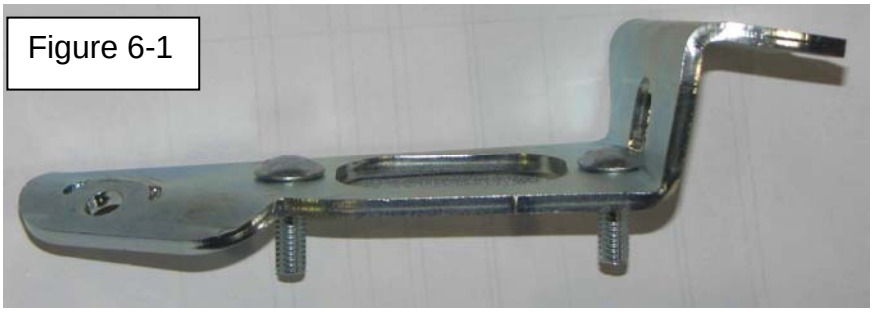


Figure 6-1

Step 7: Install Shocks to Frame Brackets: With the two carriage bolts protruding from the bracket as was shown in figure 6-1, place the bar-pin of each shock onto the two bolts, then add the supplied flanged nuts and tighten. As noted in the last step, the forward carriage bolt in each frame bracket is trapped by the frame, but the rearward one is 'loose' and will need to be held in place during assembly – use your finger through the tombstone-shaped opening at the back of the bracket to hold it down while tightening the nut.

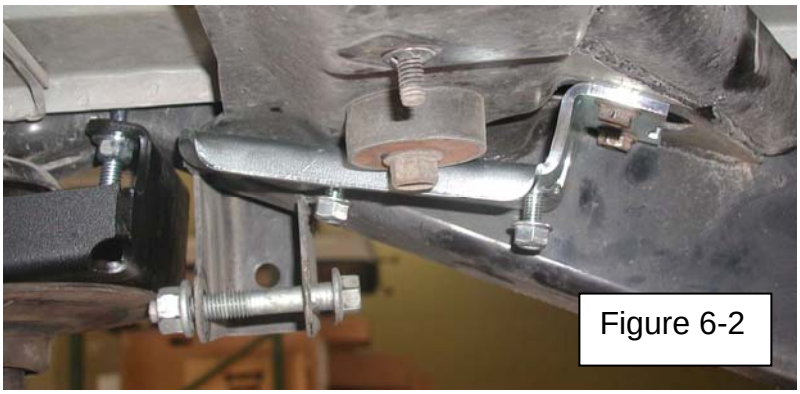
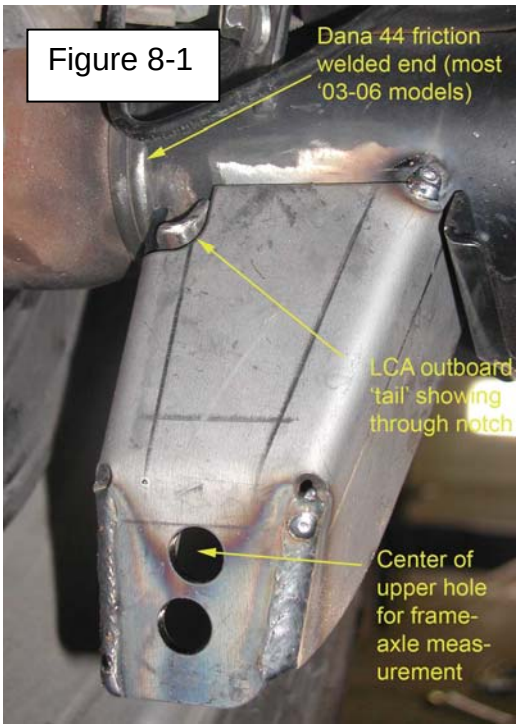


Figure 6-2

Step 8: Positioning & Welding Axle Brackets.

This is the key step of the SS installation – take time to get it right! For a 'perfect' install, the lower axle brackets must located in two dimensions – inboard/outboard and rotation around the tube. How to locate in each direction is handled separately in the sub-steps below:

8a: Lateral (Inboard/Outboard) Position is easy for the stock Jeep axle with stock drum or disc brakes: the vertical side of each bracket goes towards the tire and the notch at the top should 'straddle' the tail of the outboard side of the lower control arm (LCA) bracket. On mid-2003 and later TJs with Dana 44s, the flared part of the axle ends is 'friction-welded' – which produces a double 'ring' of material around the tube just outboard of the LCA bracket. On these axles, the outboard side of the SS bracket will fit on the tube in the narrow gap between this 'ring' and the LCA bracket's tail as in **figure 8-1** Note that in this figure the 'tail' comes through the notch – this will occur on low lift heights and/or long-wheelbase applications, but on short wheelbase TJ's with more than 4" of lift, the tail may not actually enter the notch, but should still be aligned to it.



8b: Rotational Position Note: For accurate placement, *be sure to do this step with the vehicle resting on its springs both front and rear* – i.e. at it's normal/intended ride height. If the axle is out of the vehicle when this step must be performed, you should estimate the pinion angle relative to ground as closely as possible and put the axle at this angle on the bench to do this step.

Rotational Position around the axle tube depends on how much your axle is rotated for use with a CV driveshaft which in turn depends on your lift height – consequently you cannot use the existing brackets on your axle as a reference. Instead, you should use an angle-finder to position the

Note: Non-Jeep disc brakes. If you have disc brakes other than the factory Jeep (Bosch) units found on TJ Rubicon and other late TJ models, you may need to adjust the lateral position of the SS axle brackets to assure shock-to-caliper clearance. Normally, with the SS bracket notches straddling the outboard LCA 'tails', the lower shock "eye-to-eye" distance should be about 47.5" – which will clear factory Jeep disc brakes. If your other disc calipers are larger, you may need to move the brackets inboard to assure clearance.

bracket. To do this, place your angle finder on the surface of the bracket that has the two holes and rotate until this surface is leaning 9° "back" from vertical as shown in **figure 8-2** – this should put the surface roughly in alignment with the front edge of the large hole in the upper frame brackets (i.e. where the top of the shock will be). Exact alignment is not critical because of the adjustability feature in the next step, but make sure that both left and right brackets are tacked in place at the same angle. Once both brackets are firmly tacked in three places, proceed to Step 9 – only after completing Step 9 should you final-weld to the axle tube. Remember that the axle tube should be free of paint as shown to assure good welds.

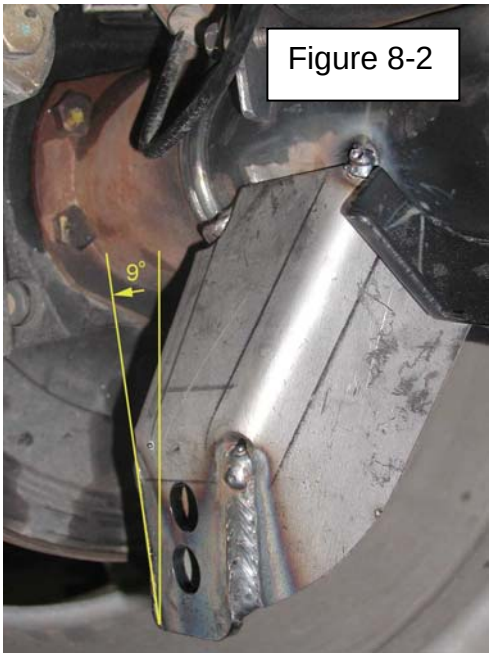


Figure 8-2

Step 9: Install Lower Shock 'Clevis' to Axle Brackets: Each clevis features an offset mounting hole and can be mounted into either of the two holes on the new axle brackets in either a 'biased up' or 'biased down' orientation – this gives a total of four possible shock-eye positions that cover a range of 1-1/8" as shown in **figures 9-1a** (highest/shortest setting) thru **9-1d** (longest/lowest). The purpose of this adjustment feature is to allow you to get the shock travel to match the other travel limiter of your suspension – your bumpstops. The goal is to have the shock reach it's minimum length at just the same time as the bumper is fully compressed against the axle seat – so that the maximum available shock travel is actually used to provide maximum droop and thus flex *potential* (note this is different than static flex on a ramp, etc.). There is more than one way to determine what setting you should use – the ideal way is outlined in Step 9a, while Step 9b is a fairly accurate alternative. Step 9c is an alternative if you're in a hurry or don't care about maximizing your articulation (a or b can still be done later).

Note that methods 9a and 9b should focus on the right-rear (for Left Hand Drive Jeep; prioritize LR for RHD) shock, then replicate the same settings on the other side. Don't base your setting on the side the


Figure 9-1a


Figure 9-1b


Figure 9-1c


Figure 9-1d

steering wheel is on or use non-equal settings as you will be misled to incorrect settings by the fact that the axle is usually shifted to the driver's side slightly when fully 'up' toward the frame. When you're ready to tighten the clevises to the axle brackets according to one of the methods below, keep in mind that they must be angled inboard a bit so that the shock eye will line up and allow the factory lower bolt to be inserted. It is sufficient to 'eyeball' this angle and adjust it by move it with a long screwdriver through the clevis holes later. Before you follow one of the methods below, take some time to measure the distance from the Figure 9-2strike surface in the middle of your axle seat to the lip of the bumpstop cup

– this is your setup's "uptravel potential" and for best all-around performance it should be about 4.50-5.25" regardless of lift height. Note that this must be measured with the vehicle resting on *all four* springs - not jackstands under the anywhere under the frame because this will throw off the ride height considerably. If it's high, then you probably don't have enough bumpstop spacing (and your tires may travel too far into the wheelwells, etc.); if it's less, you probably have more than you need (*or* you are simply sitting low due to a lot of weight, which is not a shock-packaging issue), but if you're "in the ballpark", leave it for now and see how things turn out below.

9a: Springs-out Method (Recommended) The only way to know *for sure* that your bumpstops will protect your shocks from bottoming damage (and you're getting the most flex possible) is to take the rear springs out, remove the actual bumpers from of their cups and let the vehicle down until the cups are resting on the axle seats – this is truly the highest the axle can ever come relative to the frame.

Now with the springs removed and the frame/cups resting on the axle, measure the distance from the installed SS upper bracket (where the shock's bar pin will be attached) to the center of the higher of the two holes in the tack-welded lower axle bracket. Next make the equivalent measurement on your actual shock when it's fully compressed. (If your shocks are too hard to compress fully, measure them extended and subtract the length of the exposed rod to get the minimum length.) Now subtract the two measurements and follow the chart to determine which way to mount the clevis.

Shock Minimum minus Frame-Axle	**Mount Clevis to Axle Bracket's**	**Orientation of Clevis**
-0.375" or less	Shocks are too short – subtract bumpstop spacing if tire size permits & uptravel is more than 5.5"…or use longer shocks.	
-0.375" to 0"	Upper Hole	Biased Up (**fig 9-1a**)
0" to 0.375"	Upper Hole	Biased Down (**fig 9-1b**)
0.375" to 0.750"	Lower Hole	Biased Up (**fig 9-1c**)
0.750" to 1.125"	Lower Hole	Biased Down (**fig 9-1d**)
1.125" or more	** Shocks are too long for available uptravel! Add bumpstop spacing (leave at least 4.5" uptravel potential).	

NOTE: If your shocks turn out to be either too short or too long according to this chart and you tack-welded the brackets as advised in step 8, you can consider repositioning them to 'cheat' the 9° angle by a few degrees either way to bring the measurements into range, but there are considerations:

- If your shocks are too short, rotating the brackets 'up' will help, but this will also move them rearward too and could result in the passenger shock getting too close to the tailpipe (remember it shifts inboard during droop, so there needs to be plenty of clearance when sitting flat!).
- If your shocks are too long, rotating the brackets 'down' can help, but be sure that the shock and axle bracket will not collide with each other during full droop. This can be done to allow fitment of OME N67L ('longtravel') shocks on a 3" lift for example.


Figure 9-2

9b: Calculation Method. If you can't or don't want to remove the springs, you can do the same as in 9a, but your frame-axle measurement will need to have the 'uptravel potential' subtracted from it – then simply follow the chart in 9a to position the clevis. You should understand that this is not an 'exact' procedure even if your measurements are exact – because the shocks don't necessarily compress exactly the same amount as the wheel's travel (this relationship is called the 'motion ratio' of the shock and varies with wheel position) - though with the SS it's generally close to 1:1, which is why this method gets you fairly close.

9c: No Optimization If you don't have the time now or you don't have your final shocks yet, you can simply "play it safe" and put the clevises in their lowest orientation. Assuming your shocks are at least reasonably close to

correct for your lift height, this should assure that you won't risk bottoming them prematurely. The only negative side effect of non-optimization is a loss of some 'droop travel' and thus overall articulation will also be less than it could be.

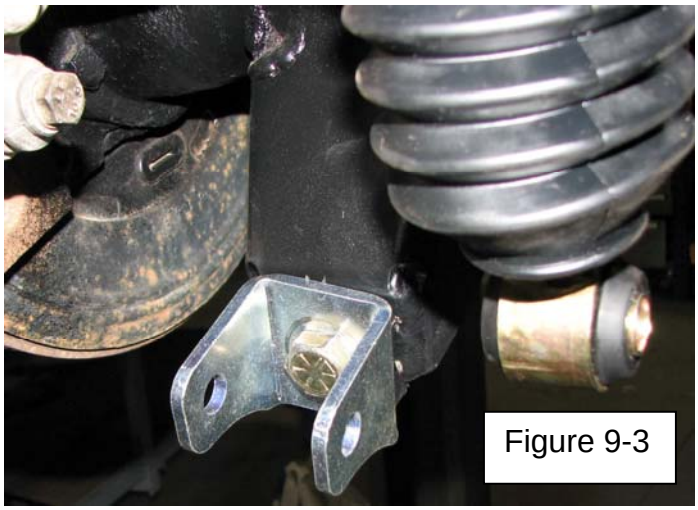


Figure 9-3

Once the brackets are positioned, weld in short increments and allow the tube to cool in between to avoid warping the tube. Weld around the top/rear and inboard sides and even to the end of the LCA bracket 'tail' as shown in **figure 9-2**. You must also weld the outboard portion of the bracket (because it will eventually rip off the axle if don't), but it can be done on either the outside (facing brakes - awkward to see/reach with brakes on but feasible – or of course remove the brakes), or the inside (visible from the front). A typical welded bracket will look like figure 9-2. Paint the brackets and axle tube after the welds have cooled, then attach the clevis according to the chart – which will now look similar to **figure 9-3** (shock shown hanging from upper mount – ready to be attached to the clevis).

Step 10: Fit/Clearance Check. Now that installation is complete, it is recommended that you confirm your shock length and SS clevis settings are good during articulation events. Use a ramp or suitable substitute to flex your Jeep to its limit (i.e. a rear tire comes off the ground). While the Jeep is flexed, measure the shock's length (the same way you did in step 9) and subtract the remaining amount of uptravel potential that is still available between the axle and the bumpstop (there will still be some left because the Jeep is usually not heavy enough to fully compress the rear spring and jounce bumper while sitting still on a ramp). If the result of the subtraction is less than the shock's minimum length you determined for step 9, you should either add bumpstop spacing (if more tire-to-fender clearance is needed) or lower the clevis setting on the axle brackets (if there is enough tire clearance left).

Step 12: Remove Original Shock Brackets from Axle. Cut off the original shock brackets using a plasma cutter or sawzall, then grind the axle tube smooth and paint. Be careful not to cut or grind into the tube as this will weaken the axle!

Clearance and other Notes:

- The Shock Shifter will accommodate shocks with hard metal 'stone shields' (instead of boots, such as Old Man Emu shocks). Clearance to the track bar frame bolt will be tight, but if the bolt is inserted from the rear of the vehicle, there will be enough clearance. We recommend that the 'Torx button head' bolt that was originally found at the axle-end of the bar be used at the frame end with the head towards the shock to maximize clearance.
- Because the SS lowers have 1-1/8" of adjustment range, it shouldn't ever be necessary to adjust past that range, but if for some reason you do, the easiest way to re-angle the lower brackets after they have been welded is to simply slit the sides of each bracket (using a plasma cutter or sawzall) up close to the axle tube to simulate 'rolling' the bracket around the tube. Then bend the bracket to the new position and re-weld the slits. This will be *much* easier than trying to fully remove and reweld them!

WARNING: Bump Stops vs. Shock Length.

Everyone wants to run the longest possible shock – because they believe it's the key to maximizing articulation. However, this is not the only key to 'maximum travel', and running too-long shocks comes with several penalties and side effects. Shocks (and the brackets they're mounted to) are *not* designed to be your up-travel (compression) limiter – your jounce bumpers are (aka 'bump stops'). Your lift kit *should have* included bump stop spacers – but unless it is an Nth Degree suspension system, it probably did not come with *enough* spacing. A rough guideline is that your bumpstops should allow for 4 to 5" of uptravel before metal-metal contact occurs (i.e. don't count the bumper itself – remember that it *compresses* when the axle hits it - fully into the cup is possible!). Proper matching of suspension travel and shock minimum and maximum length is a basic requirement for a proper-functioning suspension that most suspension companies leave for *you* to figure out…this kit requires that you actually do this to assure correct function and a lasting setup.

As is detailed in the instructions above, you must check your TJ to make sure the shocks do not bottom before the bumpstops are fully compressed (this means you need to measure from the axle to edge of the cup that the stock bumper mounts into). A reasonable method for determining whether your shocks are too long is to flex your TJ until a wheel is in the air while the vehicle is going 'up hill' (forward on an RTI ramp) – then check to see that there is some compression travel still remaining in the 'stuffed side' rear shock. If you can't see the shaft due to a dust boot, unbolt the lower end while flexed and see how far up you can push it. If the bumpstops aren't fully compressed (or don't even touch!) before the shock bottoms out and you do not correct this with longer bumpstop extensions or shorter shocks, you WILL have problems – whether using the Shock Shifter or not. Also note that rear springs designed for correct ride frequency (such as Nth° springs) will not fully compress during a static test (but will compress further due to dynamic loads such as when bouncing up a difficult hillclimb) – in this case you can still figure out your suspension during a static 'flex test' by making sure that the shock has more travel left than the gap that remains between the axle and the lip of the bumper's mounting cup at the closest point.

Remember that every 'system' of any kind always must have a 'weakest link' by definition – in this case there must always be a part that will break first. Since most aftermarket off-road shocks are overbuilt with 18mm rods, the casualty of incorrect bumpstop spacing is usually a failure of the mounting brackets, not the shock - this is the shock companies' way of assuring that you don't call *them* when things break – because if the shock fails due to too-little spacing, *it's not their fault*!. For stock TJ rear axle shock mounting, the failure that usually occurs is that the stock lower bracket is torn off the axle tube (which is often a reason for buying the Shock Shifter!). When the Shock Shifter is added - but the mis-match problem is not corrected – the weakest part of the system then becomes the SS upper bracket (note this is the weak-*est* part…which *doesn't mean weak*!) - and you will bend and eventually break them. *This is not a design flaw with the Shock Shifter and is not warranted!* Like the shock manufacturers, AEV-Nth° has 'overbuilt' the upper brackets to tolerate a lot of abuse if the shocks are bottoming out and hammering the mounts, so if your brackets ever become distorted *it means you have the bumpstop spacing problem and must correct it*. AEV-Nth° will sell you a new bracket, but you must correct the problem or it will simply happen again.