

Installation Instructions: **Shock Shifter™** – TJ Wrangler w/ stock axles

Kit Part Number	Nth23100
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, or...it can be used with other factory-'type' axle housings such as '87 XJ or MJ 'Big Ton' package Dana 44 axle that have 2.75" tubes with flared ends.
	Typical TJ lift shocks with <i>removable</i> urethane EB1 bushings are used. (factory shocks and possibly others with bonded-in bushings will require new replacement urethane bushings – call to order)
	The inner metal in the lower bushing is 1-3/8" long (this is the correct size to fit the stock TJ axle bracket).
	The shocks being used are an appropriate length for the amount of lift on the vehicle.
	The proper amount of bumpstop spacing is in place to prevent the shock from being the suspension's up travel limiter (see warning on last page).
	The frame is unmodified in the area where the fuel tank crossmember meets the frame rails. (see notes in text regarding '97-'98 TJs)
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 or TIG Welder and related equipment. ** Only a qualified person should perform all welding!!
	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'!

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-headed 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

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'bar pin' originally. The bracket should extend forward and rest against the angled surface at the front

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 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.*

edge of the frame crossmember (**figure 2**). You should drill the needed hole in the frame directly through the bracket while it is in place (be carefull 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.

Step 6: Install Frame Brackets. To do the final install of each frame bracket, tighten the two original bar pin bolts and add the supplied 3/8" x 1.0" long bolts and all-metal locking nuts through the drilled

holes. Start the new 3/8" bolts before tightening the bar-pin bolts, then tighten them to 35 ft-lbs. For the new 3/8" bolt, you will need to hold the nut by hand to start the bolt, then use an open-end wrench to finish tightening it. The finished assembly should look like **figure 3**.

Step 7: Prepare Shocks. You will no longer need the bar-pin in the upper bushing of the shock since the new frame bracket uses a through bolt. Press the bar-pin out of the upper bushing and also remove the steel inner sleeve from the lower bushing. Press the sleeve into the upper bushing – it is no longer needed at the bottom since the bottom will now use a 5/8" bolt into the new SS axle bracket. The sleeve will insert easily in most cases if you spray some white lithium grease either onto it or into the bushing.

Note: Typically shocks used on TJ's will have an "Eye-Bushing-type 1" (EB1) bushing at both ends. This common bushing size should have an inner diameter of approximately 5/8", and the inner metal sleeve has an inner diameter that will clear a ½" bolt (though you will re-use the 12mm metric (M12) bolt that was previously used on the axle end).

Step 8: Pre-Install new Axle Brackets. In step 10 you will weld the new axle brackets to the axle tubes; you should read ahead to familiarize yourself and choose the methods you will use. Assuming you are using the recommended methods for positioning the axle brackets by using the shocks, you need to attach them to the new brackets before they are welded on. Begin by placing one 5/8" SAE washer

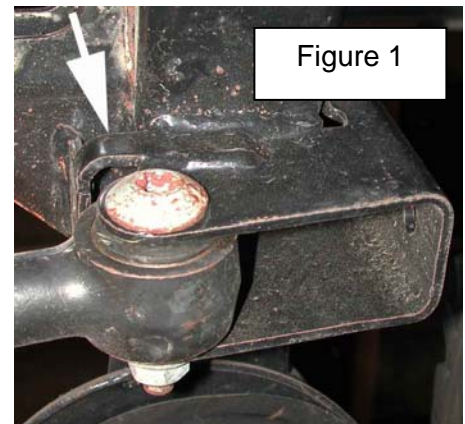


Figure 1

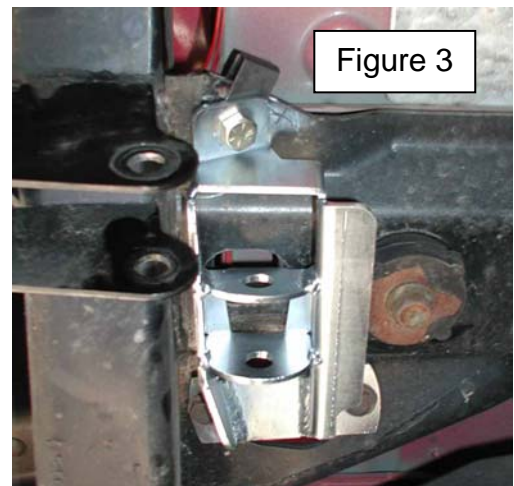


Figure 3

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(small O.D. silver ones) onto a 5/8 x 3.25" bolt, then insert the bolt through the shock bushing (some white grease will help). Place another of the same washers over the shock bushing and add a 5/8"-18 jam nut. Tighten the jamb nut *by hand* (no air tools) until you see the bushings slightly compressed between the two washers as shown in **figure 4** – there is no need to 'torque' this nut tighter than 'snug'. Caution: *forcing the nut further will damage it or the bushings and possibly make it impossible to remove later!*

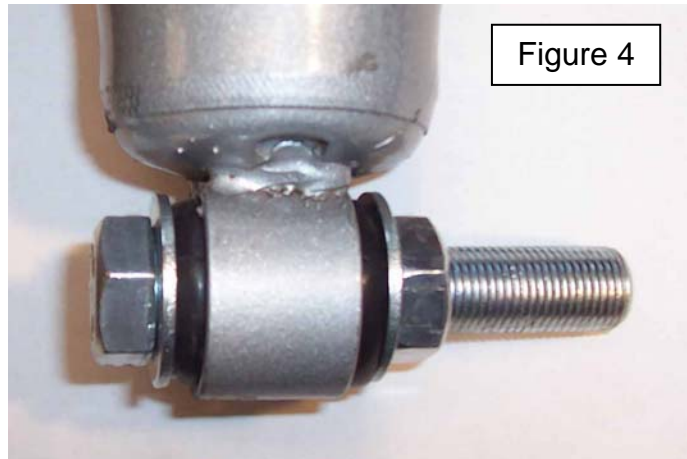


Figure 4

To attach the new 'bolted shock' to the bracket, the extra 'washer' attached to the bottom of each bracket must be removed (twist it off or cut it – **figure 5** shows the passenger-side bracket & washer separated) – this will be used as a 'backer' for the bolt. Add one of the hardened 5/8" washers (large O.D. & gold color) to the bolt and then put it through the slotted hole in the bracket; now add the backing 'washer' in the same orientation as it had been attached, then finally put on a 5/8" top-lock nut. For now, tighten the assembly to 'snug' only with the bolt at the lowest end of the slot – away from the axle tube as shown in **figure 6**. Note: the special backing washer will eventually be welded inside of the main bracket to 'set' the position of the shock's lower mounting in step 8c; repeat for the

EXPLICIT INSTRUCTIONS FOR HOW TO TIGHTEN THE TOP-LOCK NUT: To assure a solid connection that will remain tight and to avoid damaging the bolt threads, tighten as follows: Use a socket and ratchet or impact wrench on the top-lock nut while holding the bolt from turning with a standard wrench on the head of the bolt, *not on the jam nut*. Do not rotate the bolt with the wrench – only turn the top-lock nut. *If you rotate the bolt during tightening, you may cause the jam nut to over tighten past the end of the threads on the bolt, making it difficult or impossible to remove later.*

other side/shock.

Step 9: Install Shocks - Top Ends: The best methods for placing the new weld-on lower brackets in step 10 involve using the shocks themselves, so now is the right time to attach them to the new frame brackets. Using the bolts and nuts that originally held the lower end of the shock to the stock axle bracket, attach the top of the prepared shocks to the frame brackets. The bolts will need to be inserted from the rear of the vehicle. **Note:** Some shocks (such as Old Man Emu) use narrower-than-normal bushings and two thin washers in conjunction with the upper bar pins. On these shocks, the lower inner metal sleeve can still be used to replace the bar pin, but you will need to add one 5/8" SAE washer (supplied) to make up for the narrower bushing. If needed, place this washer on the side of the bushing that will be towards the *front* of the Jeep before installing. Tighten them to 50 ft-lbs.

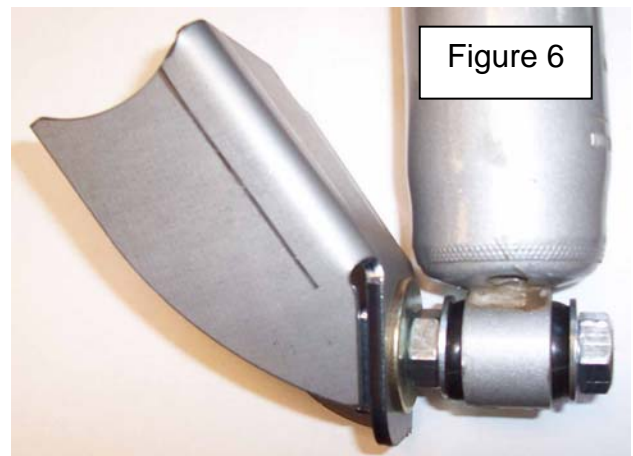


Figure 6

Step 10: Positioning & Welding Axle Brackets.

This is the most critical step of the SS installation – take time to get it right! For a 'perfect' install, you must locate the shock/bracket in three dimensions – inboard/outboard, rotation around the tube, and up/down. Each of these is handled separately in the sub-steps below:

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10a: Lateral (Inboard/Outboard) Position is easy for any stock axle with stock Jeep 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 7**.

Note: Non-Jeep disc brakes. If you have disc brakes other than the factory Jeep (Bosch) units found on Rubicon TJs or swapped in from '96-'98 ZJ Grand Cherokee or '96-'01 solid axle Ford Explorer/Mountanier), you may need to adjust the lateral position of the SS axle brackets to assure clearance - and you should use Method 1 below. Normally, with the SS bracket notches straddling the outboard LCA 'tails', the bolt-to-bolt distance should be about 47.5" – this will clear factory Jeep disc brakes, but if your other disc calipers are larger, measure the narrowest point (heads of banjo bolts or park brake lever on GM/Cadillac calipers). If the dimension is less than 47.5", and/or the narrowest point is lower than the center of the axle tube (when the axle rotation is set for the drive shaft angle), you will need to move the brackets inboard to assure clearance and definitely use Method 1. When setting the position in Method 2, set the lateral position to give at least ½" between the shock bodies and the closest point on the calipers when the Jeep is sitting on flat, level ground.

10b: Rotational (around tube) Position around the tube depends on your lift height and how much your axle is rotated for use with a CV driveshaft. You can use either of the methods below, but we recommend method 1 if at all possible. While setting rotation, make sure you keep the LCA 'tail' used to set lateral position aligned with the notch – it may not protrude *through* the notch, but rather is only *visible* through it. You will weld the bracket to the axle in this sub-step since the third (length) position will be finalized afterward. **Figure 8** shows a finished installation from the side view to show how the show-to-bolt relationship should look when this method b1 is done correctly.

Note: Axle Bracket to Shock Bushing Alignment. Since the lower shock bushing will now mount on a longitudinal axis, pinion rotation is an important factor in setting position – if you plan to significantly change your axle's pinion angle at a later time (either by changing to a double cardan drive shaft; adding more lift or a high clearance center skid such as an Nth^o Tummy Tucker™), you will need to modify these brackets at that time to keep the bushing 'square' to the new SS axle brackets (see notes at end for more info).

Method b1: Rotation position on-vehicle using shock (RECOMMENDED). If the vehicle is already lifted, the axle pinion angle is set, and the vehicle is resting on it's springs with 'normal' weight (i.e. NOT hanging on a two-post lift), you can use the shock mounted to the new upper/frame bracket to set the axle bracket's rotation position on the axle tube. With the shock bolted to the bracket as described above, seat the bracket against the axle tube – be careful not to flex/skew the bolt in lower shock bushing – then tack weld it in place. Before fully welding, it is advisable to test for proper shock clearances –perform steps 11 and 12 now and return here after any corrections to the axle bracket positions are made.

By either method, once the position is set, weld all three outside faces of the bracket to the housing. The axle tube should be free of paint to assure good welds; weld in short increments to allow the tube to cool to avoid warping the tube. Do not skip welding the outboard side of the bracket! – it will eventually rip off the axle if you skip this side. If the axle is installed under the Jeep, a good welder may be able to perform the awkward overhead outboard welds without having to remove the brakes from the axle, else removing them will make access much easier. Paint the brackets and axle tube after the welds have cooled.

Method b2: Rotation position using LCA 'tail' as reference point. If your rear axle is out of the Jeep and/or your suspension height (i.e. lift) is not yet set, you can roughly locate the SS bracket relative to the 'tail' of the LCA bracket's outboard side. The notch in the SS bracket is made to line up with this 'tail', and can be used to set rotation fairly accurately if you can't check the setup on the Jeep using method 1. The following guidelines assume you have approximately +4" of *driveshaft* lift (suspension lift plus effect

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of high clearance skid such as Nth Tummy Tucker): If you *do not* have a double cardan driveshaft, the rear face of the bracket should be flush with the end of the LCA bracket's tail. If you *do* have a double cardan driveshaft, your pinion angle should be steeper – in this case the tail of the LCA bracket should *not* be protruding into the notch, but should be just barely even with the *inner* (forward) surface of the SS bracket (this compensates for about 8 degrees of pinion rotation). If your suspension lift height is more/less than 4" (and you have a double cardan drive shaft) you can adjust as follows: each inch of lift requires roughly about 2 degrees of axle rotation, which is a little less than 1/16" as measured around the axle tube.

10c: Shock Length/Bolt ('Up/Down') Position can be set by moving the position of the lower bolt in the slotted hole of the new axle bracket. The purpose of this is to allow you to get the shock travel to match the other travel limiter of your suspension – your bumpstops. The idea is to have the shock reach it's minimum length just at the same time as the bumper is fully compressed against the axle seat. As with the rotation, there is more than one way to do this – the ideal way and some less-ideal-but-workable ways. For methods c1 and c2, perform the procedure on the passenger side (right-rear) shock, then replicate the same result on the driver's side – do not repeat the above procedure as you will be misled by the fact that the axle is usually shifted to the driver's side slightly when fully 'up' toward the frame. Instead, measure the position of the backing washer on the passenger side and duplicate it on the driver's bracket.

Method c1: Springs-out Test (Recommended) The only way to know *for sure* that your shocks are protected from bottoming by your bumpstops is to take the rear springs out and let the vehicle down until the bumpstops are holding the rear of the Jeep up – even better is to pop the bumpers out of their cups too and let the cups themselves rest on the axle seats – this is truly the highest the axle can ever come relative to the frame. Before removing the springs, measure the distance from the strike surface in the middle of your axle seat to the lip of the bumpstop cup (not to the bottom of the bumper) – this dimension should be about 4.5-5.5" depending on your lift – if it's more, then you don't have enough bumpstop spacing to protect your shocks; if it's less, you probably have more than you need, but if you're "in the ballpark", leave it for now and see how things turn out here.

When you remove the springs and let the Jeep down to rest on the axle, if your already-attached passenger shock bottoms before the cups touch the axle, then either they are too long for your lift height and/or you do not have enough bumpstop extension installed (if the measurement was over 6", then you definitely should add bumpstop spacing). If the shocks don't bottom first, then you can adjust the SS brackets to 'use up' some of the remaining shock travel by loosening the 5/8" top-lock nut and sliding the bolt upward while compressing the shock. Move the shock up until it is fully compressed, then re-tighten the 5/8" nut. (If the shock had more than 1.0" of travel remaining, you may want to consider longer shocks to get the best match for your present lift height). At this point you've set the ideal mounting-point position for your specific shock, bumpstop, & spring (lift-height) combination. Replicate the washer position on the driver's side.

Method c2: Measuring If you can't or don't want to remove the springs, you can estimate the position by measuring the 'uptravel potential' of your rear suspension and then checking the shocks with a little math work. This must be done with the vehicle resting on ALL FOUR springs (and tires) and nothing else. Understand that this is not an 'exact' procedure even if your measurements are 'exact' – this is because the shocks don't necessarily compress exactly the same amount as the wheels 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.

Measure the distance between the raised area in the middle of the axle seat to the edge of the 'cup' that holds the factory bumpstop, and also measure how much compression travel the right-rear shock has available at ride height by measuring how much shock rod is exposed (if you can't see it, you'll have to temporarily remove the shock and measure it fully compressed and subtract that from the on-Jeep measurement to get the measurement you need). You want the shock measurement to be between 0-1/2" more than the other; if it is more than that, you can raise the lower shock bolt in the slot until the difference in measurements is 1/4" or so. If you cannot raise the bolt enough, you may want to consider longer shocks. Once you've set the position, replicate the washer position on the driver's side bracket.

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Method c3: Ignoring (no optimization) If you don't want to worry about ideal matching of your shock travel to your suspension's travel potential or you don't have your final shocks right now, you can of course weld the washers wherever you want. If you weld them at the bottom of the slots, you can fit the longest travel shock and is a good idea if you will be using non-remote-reservoir monotube shocks (they have the most 'dead length' for a given shock travel). Welding them at the top of the slots will require a shorter shock and/or more bumpstop spacing, and you may be able to trim some bracket for more clearance if you feel you need it.

Once you have determined your bolt position and set it on both brackets, weld the corners of the brackets first, then weld the washer to the inside after (**figure 9** shows a back-side view before welding – weld at least the side edges of the plate/washer). Note that you may bend the brackets slightly to square up the bolt/bushing alignment if you 'missed' slightly with the process you used in sub-step 10b.

Step 11: Fit/Clearance Check. Now that installation is complete, it is recommended that you confirm your shock length is not too long by cycling the suspension through full articulation on a ramp, etc. To be sure the shocks will not bottom, remove the lower end of the compressed shock from the axle stud and confirm that it still has some compression travel left over. You should also check that the shocks will not bottom if both wheels are compressed ('jounced') simultaneously by measuring (while parked on a flat surface) the distance between the axle striker (in the middle of the spring) to the edge of the steel cup that holds the jounce bumper. Next measure the distance the centers of the top and bottom bushings on the installed shock and subtract the minimum distance (of the fully compressed shock). Compare the remainder of this subtraction to axle-to-bumper cup measurement - if it is less, you may have problems if you bottom out the rear suspension.



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! Your Final installation should look like **figure 10**.

Clearance and other Notes:

- If your shocks are ones recommended by Nth° for your specific Nth° suspension system, the optimum position for the adjustable lower mounting bolt on the new SS axle brackets will generally be near the middle of the slot as long as you are using the bumpstop spacing that was supplied with your system.
- The Shock Shifter will accommodate shocks with hard metal shaft 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
- Disc Brake Clearance Option: GM and Ford-style calipers (especially Mustang w/ park brake levers and large coiled springs) will not clear with the axle brackets at the intended 47.5" distance. If moving the SS axle brackets inboard to clear is not acceptable, it *may* be possible to reverse the caliper and brackets (by swapping side-to-side) to move the brakes ahead of the axle tube, and still be able to reconnect the park brake cables, but Nth° cannot guarantee this will work. Note that the taller your lift height, the larger the caliper interference issue becomes – so measure/check carefully before 'wheeling'.

If you need to change the position of your lower brackets after they have been welded, it is not advisable not try to remove the brackets as they are difficult to cut off cleanly (you will destroy them and need new brackets most likely). Instead, simply slit the sides of each bracket (using a plasma Figure 9

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- cutter or torch) – do this up close to the axle to approximate ‘rolling’ the bracket around the tube. Next bend the bracket to the correct position and re-weld the slits.

WARNING: Bump Stops vs. Shock Length.

Everybody wants to run the longest possible shock, but this is not the only key to ‘maximum travel’, and running too-long shocks comes with several penalties/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 between 4-5” of uptravel before metal-metal contact occurs (i.e. don’t count the bumper itself – remember that it *compresses* when the axle hits it...down to ZERO thickness 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!

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 makers trying to make sure you don’t call *them* when things break – because if the shock fails due to too-little spacing, *it’s not their fault!*. Thus with the stock shock mounts, 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 - you will bend and eventually break the SS upper bracket(s) as shown in **figure ____**. *This is not a design flaw with the Shock Shifter and is not warranted!* Like the shock manufacturers, Nth° has ‘overbuilt’ the upper brackets to tolerate a lot of abuse if the shocks are bottoming out and hammering the mounts, but our totally un-reinforced prototype brackets are still in service years later with no issues despite brutal use of the Jeeps they’re on, so if your brackets ever become distorted as shown - *it means you have the bumpstop spacing problem and must correct it*. Nth° will sell you a new bracket at a discounted price, but you must correct the problem or it will simply happen again. With the SS is 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.



Figure 10