

# Installation Instructions: Universal Stinger™ - Coil Suspensions

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| <b>Kit Part Numbers &amp; Applications</b><br><br>Note: These instructions cover <u>link+coil spring</u> suspensions using a Universal-type Nth° Stinger <i>only</i> | <b>Nth14120</b> 15-20" rear driveshaft (YJ, or TJ Wrangler, 93.4" wheelbase)<br><b>Nth14121</b> 20-25" rear driveshaft (TJ Unlimited, 103.4" wheelbase)<br><b>Nth14122</b> (unfinished for other applications or altered wheelbases)                                                                                              |
|                                                                                                                                                                      | <b>NOTE:</b> This "Universal" Stinger™ uses a 'base' (instead of a Slider™) that is designed for a type of axle (such as all high-pinion Dana 60 axles.) However, since aftermarket castings vary in shape, this kit requires some fitting and easy welding to properly complete the installation.                                |
|                                                                                                                                                                      | These kits and instructions are written specifically for Jeep <u>TJ Wranglers &amp; Unlimiteds</u> , Altered-wheelbase TJs or other coil spring vehicles should use 14122 and can follow these instructions as a general guide only.                                                                                              |
|                                                                                                                                                                      | <b>Assumptions</b><br>Equipment that must already be present on your vehicle                                                                                                                                                                                                                                                      |
| <b>Required Tools and Equipment</b> (in addition to common hand tools)                                                                                               | You have a Universal Stinger Base for your rear differential casting already installed. If using a <i>stock</i> housing with no top mounting provisions (such as tapped holes or a 'bridge'), then you will also need to purchase or fabricate an upper attachment based on the differential cover bolt pattern. Call for help.   |
|                                                                                                                                                                      | TJ Wranglers have an Nth° Tummy Tucker™ center skid plate; if not, fabrication will be required (see DIY steps).                                                                                                                                                                                                                  |
|                                                                                                                                                                      | A minimum of +1.5" of suspension and/or body 'lift' (if applicable to your vehicle) above stock is already installed.                                                                                                                                                                                                             |
|                                                                                                                                                                      | The suspension/lift being used does NOT utilize a rear upper A-arm or 'triangulated 4-link'. On coil spring vehicles, the Stinger can only be used with a track bar and <i>one</i> trailing arm per side.                                                                                                                         |
|                                                                                                                                                                      | On 'Short Arm' TJs: if Nth° GyroJoint™ Lower Control Arms (Nth14001) are <b>not</b> being used, the existing LCAs must be of stock length (~15-3/4" from bolt-to-bolt)...If not follow notes.                                                                                                                                     |
|                                                                                                                                                                      | In order to take advantage of the geometry/handling improvements via re-drilling, a TJ must have aftermarket rear Lower Control Arms (LCAs) that use a round tube to hold an axle-end bushing of stock-or-smaller diameter.                                                                                                       |
|                                                                                                                                                                      | A double-Cardan (aka 'CV') rear drive shaft is installed (especially on wheelbases under 106")                                                                                                                                                                                                                                    |
|                                                                                                                                                                      | Floor jack and short piece of 4x4 post (or vehicle lift with a tall jack stand)<br>Two wrenches for 15/16" nuts (at least one must be an open-end wrench or crescent wrench) and a 15/16" socket & ratchet.<br>Angle Master or pendulum level (to check drive shaft and pinion angles)<br>Welder (Required for DIY versions only) |

*Please take the time to read these instructions completely before beginning – they are long because we want you to get the installation right the first time with no unnecessary delays.*

**Attention:** Nth° does not recommend use of a 'frame hoist' while installing the Stinger – Final pinion angle must be set on a drive-on hoist or the floor to assure proper bushing preloads, etc.

**Warning:** Proper Suspension configuration when using a Stinger with non-leaf-sprung suspensions. When using a Stinger with a multilink suspension that uses coils, air springs or coil-over shocks, the pinion angle will be *set and controlled* by the Stinger alone...consequently, *you must have only one trailing arm per side*. In most cases, (such as Jeep TJs), this means elimination of the original upper control arms. You can NOT use a Stinger with an upper A-arm or a 'triangulated 4-link' system – your lateral axle location must come from either a track bar, Watts link, or other linkage system that does not also play a role in axle windup control.

The Stinger is highly adjustable for drive-shaft-to-pinion relative angle, but the adjustment range is configured to give a relative angle range of about 0-5 degrees (pinion lower than driveshaft) - this means that in most cases you must use a double-Cardan (aka 'CV') drive shaft to get your joint angles correct with a Stinger.

**Step 1:** Unpack boxes; Check contents against the packing list; Verify parts are in good condition. Be especially sure that you have the right parts for your application!

**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. Do not start or attempt this product installation if you are unsure of your abilities or do not have the resources listed above. 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!!

**Step 3a:** Prepare Anchor Point (Tummy Tucker™ installations). This step assumes that you have or will be using/installing a Tummy Tucker skid along with your Stinger. Refer to the separate instructions for your TT kit and install it before proceeding with the Stinger. If you're ready now, insert the two rubber 'pivot bushings' into the tube mounted on the back edge of the TT (**figure 1**)

Note that the vertical position of the bushing pivot tube has changed over time on the YJ/TJ Tummy Tuckers – on early models, it is near the top of the back 'wall', while later TTs have the bottom of the tube flush with the bottom of the skid – this will affect which set of holes you use in the link bracket. Early TT's will use the upper ('shorter') holes in the link (see **figure 2**), while under most circumstances later TTs will use the holes near the bottom ends of the link bracket.

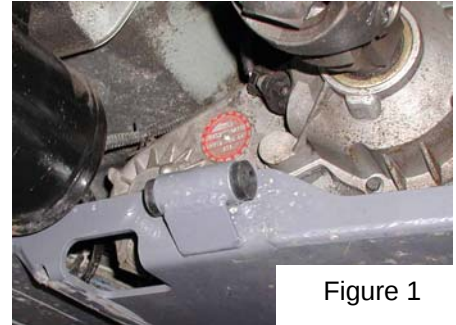


Figure 1

**Step 3b:** Create Anchor Point (fabricated installations). On all TJ Wranglers and Unlimiteds, we recommend using the Stinger with the Nth° Tummy Tucker™ as this combination has been tested extensively for fit and strength and will save you a lot of fabrication time (plus having the benefits of the TT). YJ and 2002-older TJs that do not have a Tummy Tucker will need some fabrication to mount the optional 'universal Stinger anchor' bracket (Nth29001); 2003+ TJs (including Unlimiteds) may easily attach the Stinger to their stock 'shovel' skidplate using this same bracket.

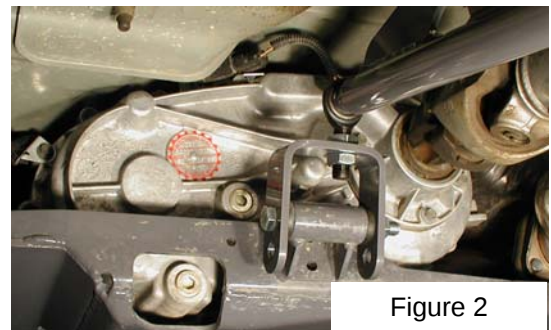


Figure 2

If your application is not a Jeep TJ and so does not allow the use of either a TT, you must fabricate an anchor point for the front of the Stinger just behind the t-case. The universal Stinger anchor bracket may also be used as a starting point for custom-fabricated applications - please call for guidance and dimensional requirements for this task.

**Step 4:** (TJ's only) Drill new LCA holes using Nth20290 Relocating the attachment points for the rear lower arms is not *required* for Stinger installation on a TJ, but performing them will significantly improve your TJ's on-road handling, it's off-road hill-climbing ability, and your under-axle ground clearance (see Stinger FAQs on website for more info) – especially if it has stock length LCAs. The geometry correction from redrilling is not necessary until the 'lift height' is +2.0" or more. The TJ LCA re-drill guide (sold separately as Nth20290) takes the guesswork out of locating the new LCA bolt holes. Refer to the separate instructions for this template (Nth30127). NOTE: lifts that keep the stock LCAs will NOT fit the redrilled axle hole location – so you can only do the frame holes (steps 4 & 5 of those instructions).

The redrilling steps are more involved than the actual Stinger installation and may take you 1 to 3+ hours depending on the axle, your speed, and your tools/facilities, but the results are well worth the effort.

Be aware that redrilling the LCA holes should be done accurately in order to keep the rear axle thrust angle near zero (axle square to frame rails) – otherwise your TJ will want to 'dog track' (vehicle will not align to direction of travel). For this reason, Nth° recommends using adjustable LCAs so that you have a

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means to adjust thrust angle in the event that your redrilled LCAs are slightly uneven side-to-side. Using the Nth Redrill guide virtually eliminates this possible issue, and using Nth's GyroJoint™ ShortArm (Nth14001) or LongArm (Nth14002 or Nth14003) kits helps even more by eliminating the need to redrill the frame brackets (plus they are adjustable).

**Step 5: Install Rod-Ends to Universal Base.** The two matching (larger) rod ends will be used to attach the boom to the base you've already installed on your rear axle. Install the rod-ends to the base first. The upper one needs a single  $\frac{3}{4}$ " non-locking jam nut pre-threaded onto it first, then thread it into the tube welded on the top of the Universal Base. The lower one will be mounted through the hole in the base directly (5.5") below the upper one you just installed. For this lower connection, first thread the regular  $\frac{3}{4}$ " nut all the way onto the remaining rod-end, then add the single large  $\frac{3}{4}$ " (gold color) washer, then place the rod-end through the hole in the base and finally secure it with the  $\frac{3}{4}$ " locking jam nut (this nut is the only  $\frac{3}{4}$ " nut in the kit that does NOT spin freely onto the threads). Orient both rod-ends so that the holes through the balls are horizontal (i.e. parallel to each other – not in-line). Leave all nuts loose for now. **Figures 3 and 4** show the installed rod-ends from the front and back sides of an un-mounted base for clarity.

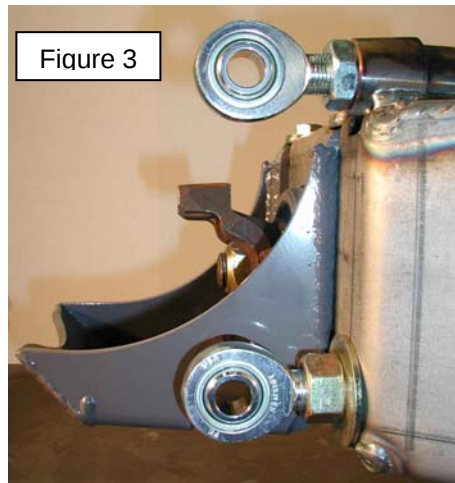


Figure 3



Figure 4

**Step 6: Assemble Boom and Link.** The 'Boom' is the actual torque arm that connects the rear axle to the anchor point behind the t-case. First assemble the rod end to the link bracket by placing the non-locking jamb nut on the rod end first, then inserting it through the link bracket from the top, then the locking nut. For now, run the locking nut up until *all* of it is just barely engaged on the threads, then run the jam nut down with your fingers until the link bracket is just barely held by the two nuts. Attach the link/rod-end assembly to the front of the boom by placing *one* of the  $\frac{5}{8}$ " washers on the bolt, then passing the



Figure 5



Figure 6

bolt through the ball of the rod-end and into the front end of the boom's tube - run the bolt all the way in, but you can more easily tighten it later when it's mounted. **Figures 5 and 6** show the assembled Stinger boom with link attached.

**Step 7: Install Boom and Link Assembly.** First connect the Boom to the rod-ends you installed in step 5

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by straddling both rod ends with the back of the boom. Make sure that the Nth° logo is right-side-up and visible from the driver's side of the vehicle for correct orientation. Line up the holes at the top-rear corner with the upper rod-end's ball and insert a 5/8" bolt from the either side. Now line up the lower holes and rod-end and insert the other 5/8" bolt. Add the 5/8" locking nuts to the bolts and tighten to approximately 50 lb-ft. Your boom/base connections should now look like **figure 7**.

Now you will attach the link bracket at the front of the boom to the anchor point you prepared in step 3. You may have to manipulate the rear axle's pinion angle manually (with a floor jack, etc.) before you can get the link bracket to 'straddle' the bushings in the anchor's pivot tube – remember that the link bracket is asymmetrical: the rod-end should be biased *closer* to the driveshaft as shown in

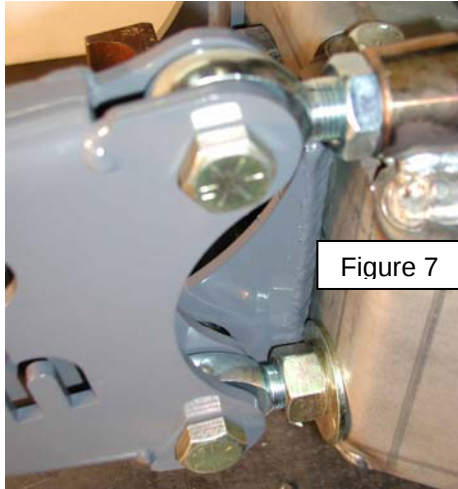


Figure 7

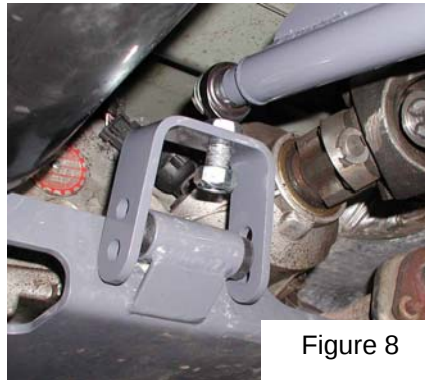


Figure 8

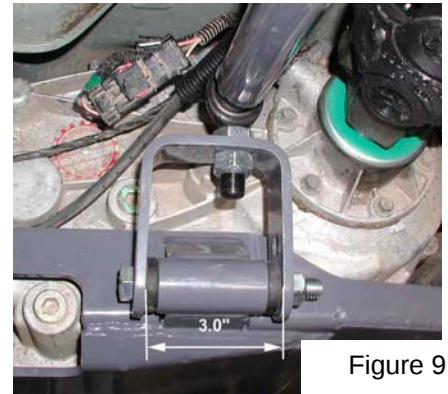


Figure 9

**figure 8.** Work the link bracket over the pivot bushings so that the appropriate set of link holes lines up with the bushings. Note that the 'heads' of the bushings 'roll over' easily, so it will take some 'wiggling' to get a 'clear hole' through both bushings and both sides of the link bracket. Once aligned, pass the 1/2"x4.5" bolt through from either side and secure with a locking nut and tighten until the pivot bushing 'heads' are compressed and the sides of the link bracket are at or just over 3.0" apart as in **Figure 9**.

**NOTE:** One purpose of the large rod-ends that connect the boom to the universal base is to 'tolerate' slight misalignment between the anchor point and the rear axle – that is, the boom can 'swing' left-right some if your rear differential is offset from your t-case. Also, while it is not important that the boom be exactly parallel to the rear driveshaft when viewed from below, you should make sure that the rod-ends are not at the limit of their misalignment range through the whole range of articulation as well as at rest on level ground. If your rear suspension has too much lateral 'shift' geometry, you could snap off the rod ends during articulation – you should check and correct your rear suspension geometry at this time to make sure you don't discover this problem the hard way on the trail!

**Step 8: Remove Upper Control Arms.** If your TJ was already set up with a CV driveshaft, you can leave the UCAs in until *after* the next step and simply adjust the Stinger to 'take over' the current pinion angle. If you are setting your pinion angle for a CV driveshaft for the first time during Stinger installation, you will need to remove both UCAs now before the next step.

**Step 9: Adjust Boom / Set Pinion Angle.** The correct relative angle between the pinion and the rear drive shaft should have the pinion at 1.5+/-0.5 degrees 'flatter' than the drive shaft angle, when measured relative to relative to the ground. The most accurate way to measure these angles is shown in **figures 10 and 11**. Note: to use the differential cover bolts to measure pinion angle, you must add or subtract 90 degrees to get a reading that is comparable to the drive shaft angle.

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The Stinger boom is designed with two methods of adjustment to set your pinion angle correctly: The primary adjustment is the rod end at the front – by adjusting the two nuts that hold it to the link bracket, you can raise or lower the front of the boom – which directly affects the pinion angle and indirectly increases or decreases the relative angle between driveshaft and pinion that you are trying to optimize. If you need more adjustment than the rod end can provide, you can also adjust the large rod-ends at the back of the boom. Extending the upper or shortening the lower rod-end will push the pinion 'lower' (more relative u-joint angle), and vice-versa.

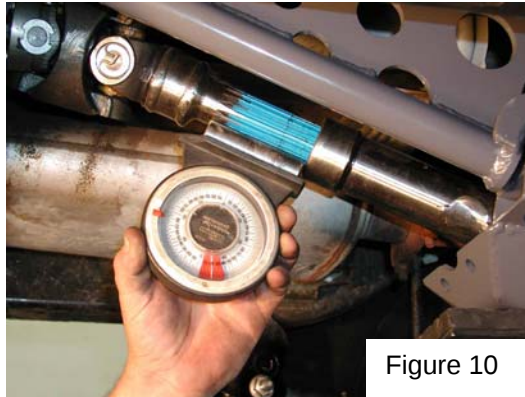


Figure 10



Figure 11

**CAUTION:** When adjusting the rear rod-ends, make sure you retain enough thread engagement on the upper rod-end into the threaded tube on top of the base. At least  $\frac{3}{4}$ " of the threads on the rod-end must be screwed into the tube (this does NOT count the jam nut). Since the threads on the rod-end are ~1.5" long, this means that there can never be no more than about  $\frac{3}{8}$ " of thread showing in front of the jam nut. On the lower rod-end it is also important that at least one thread of the shank protrudes beyond the back of the rear locking jam nut. Failure to have enough thread engagement at this point can cause the connection to fail under load and is NOT warranted by Nth°.

**Step 10: Adjust Link-to-Boom Angle.** On link-coil spring vehicles, the path that the rear axle travels up-down also generates a fore-aft motion (i.e. wheelbase change) that is proportional to the length of the LCAs. That is, short (stock)-length arms swing the axle in a smaller arc (and therefore cause much more wheelbase change) than a long-armed vehicles. The Stinger must be adjusted to allow the resulting wheelbase change throughout the axle's up-down range without 'over-angling' the rod-end at the front of the boom. On long-armed vehicles, this typically means that you want the link bracket to be at a right angle ( $90^\circ$ ) to the boom's tube when the vehicle is sitting at its normal height as shown in **figure 12**. Short-armed vehicles can usually also run at close to  $90^\circ$ , but if you are using very long shocks that allow too much droop travel, the static angle of the rod-end may need to be biased to more than  $90^\circ$  to avoid binding it at full droop. *You should cycle your rear suspension through its full range of travel while watching the rod-end to determine if adjustment of the static angle is needed.* If you need to make adjustments to get the correct link/boom angle for your installation, there are three ways to change it – some of which may not be viable in your case:

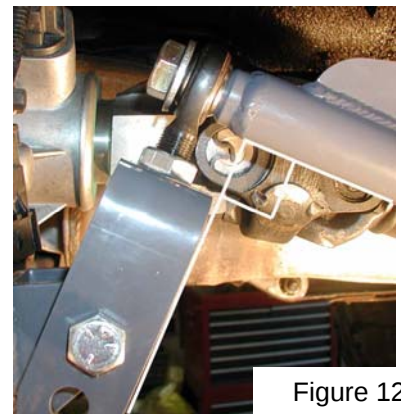


Figure 12

1. Add or subtract  $\frac{5}{8}$ " washers between the front rod-end and the nose of the boom. On most installations, you should be able to remove the  $\frac{5}{8}$ " bolt through the rod-end's ball and add washers without having to remove the Stinger boom entirely.
  2. Move your rear axle fore-aft via your adjustable rear control arms
  3. Move the boom only by adjusting the upper/lower rod-ends at the back of the boom (there is very little 'leeway' to make much change here – this should be considered the 'last resort' option).
- Once adjustments are complete, tighten the bolt to 85 lb-ft.

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**Step 11: Route Hoses/Wiring.** If you have either a Rubicon TJ or any type of air lines or wires that run from the rear differential/axle to the area of the frame near the front end of the Stinger, you may route them along the Stinger boom and secure them with zip-ties.

If you have a shortarm-equipped TJ, the rear brake line will be in 'space' with no left-rear upper control arm (LRUCA) to run along – this is simply similar to a long-arm suspension and has been tested for full range of travel with up to +6" of lift. If you have a stock rear brake hose, the only thing you may need to do is bend the tall hard line at the axle end forward slightly to put some extra 'slack' in the hose to assure it doesn't get stretched. You may also elect to remove the bracket at the middle of the hose that had attached to the LRUCA.

**Step 12: Test Drive.** The effects of your new Stinger will be very apparent on a test drive. You will notice a definitely more 'connected' feeling – that there is no more lost motion when you accelerate – the chassis just 'picks up and goes' – without shuddering, etc. Off-road you will notice more constant traction, regardless of changing conditions – especially in loose sand, snow, or mud. What you should *not* notice is any new noises or vibrations. If you hear high-speed rubbing sounds, stop driving immediately and inspect for contacts between any moving parts of the rear drive shaft, etc. and the newly added Stinger parts and correct them. If you hear/feel any new 'buzzing' sound, check the Stinger bushings to make sure they are not being 'grounded out' or 'bypassed' by metal parts that are somehow touching (for example: check that the rear bushing bolt is not touching the differential casting.) You may also want to check your vehicle on a ramp, etc. to make sure there are no contact issues during articulation. Be sure to re-torque the u-bolts after 100 miles or road driving or one off-road trip.

**Step 13: Chassis Alignment.** If you performed any of the LCA mounting hole re-drilling (using Nth20290), it is recommended that you have your vehicle professionally re-aligned after completing the Stinger installation. Make sure to mention to the mechanic that the rear thrust angle may be out of specification and that it can be adjusted using your adjustable rear LCAs. If you do not have adjustable LCAs and the thrust angle has changed enough due to the redrilling, you will notice before visiting the alignment shop that the steering wheel is no longer straight while driving straight. In this case the alignment shop will be able to center your steering wheel, but will not be able to correct the thrust angle, and your Jeep will 'dogtrack' slightly when driving straight – typically this will be so slight that it will not be noticeable to either the driver or an outside observer.