

Installation Instructions: Tummy Tucker™ – TJ Wrangler NON-Rubicon

Kit Part Numbers	TT14010 ('97-'02 w/ 32RE automatic trans) TT14011 ('97-'02 with 2.5L 4-cyl. + AX-5 manual trans) TT14012 ('97-'02 w/ AX-15 or NV3550 manual trans) TT14020 ('03-'06 w/ NV3550 or NSG370 manual trans) TT14030 ('03-'06 w/ 42RLE automatic trans)	TT14013 DIY version TT14014 DIY version TT14015 DIY version TT14022 DIY version TT14032 DIY version
Vehicle App's	'97-'03 TJ Wranglers <i>*except '03-06 Rubicon models*</i>	
Assumptions Equipment that must already be present on your Wrangler	The frame rails are unmodified in the area of the stock center skid plate.	
	Any lift being used does not use center skid plate-mounted control arms.	
	A double-Cardan (incorrectly aka 'CV') rear drive shaft is installed and the pinion angle adjusted to use this drive shaft via a Stinger or adjustable rear control arms, etc.	
	An original YJ/TJ transmission (the following models are supported:) - Manual: AX-5, AX-15, NV3550 - Automatic: 32RE (A999), 42RLE ('03-06MY TJ 4-speed)	
Required Tools and Equipment (in addition to common hand tools)	NV231 'Command-Trac' transfer case (also NV231HD or TeraLow-NV231)	
	Floor jack and ~12" piece of 4x4 post (or vehicle lift with a tall jackstand)	
	Set of Allen 'hex drive' keys or sockets up to 5/16" ('03+ Wranglers need an 8mm, but a 5/16" will work).	
	Drill and bits up to 15/32" (needed for '97-'02 TJs only)	
	Long pry bar or equivalent (autos only)	

NOTE: If you have a Rubicon TJ, a YJ, a different transfer case, or a non-stock transmission, you have the wrong instructions (make sure you don't also have the wrong TT!). If you have a Rubicon TJ or are using an NV241OR (Rubicon TJ 'Rock Trac'), you should follow instructions Nth30116 for Rubicon TJs.

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 and use the TT immediately!

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!!

Note: Transfer Case Clearances. There is no 'magic' to gaining ground clearance. The significant ground clearance gains that the Tummy Tucker skid plate provides are accomplished by 'tucking things up' by reducing some of the space between the floor pan, powertrain (trans and t-case), and the skid plate to the bare minimums (usually ¼ to 3/8"). To do this we have designed several different application-specific TT's, but even with this level of 'custom fit', the substantial factory-build variation from one Wrangler to the next may cause you to encounter 'touch' conditions that require minor adjustments – these are your responsibility to correct as Nth° has made every effort to assure that the TT will fit perfectly on the Wrangler years and models it was designed for. Be especially aware that the frames of '03-'06 TJ's are extremely variable in dimension compared to previous years, with brackets and holes that can be significantly out of position compared to Jeep's own CAD models (which were used to design the TT). There is an appendix of solutions to known issues that have been encountered in a few cases.

Also - if everything is adjusted properly - you should not have any contact issues during normal driving even though clearances around the t/case are reduced with the TT. Do not drive the Jeep with the t/case rubbing either the floor or TT for extended periods – trans or t-case failure may result!

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

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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 Current Center Skid Plate. If you have an '03 TJ with automatic, remove the front transmission skid plate first. The two frame rail bolts will come out much easier and more reliably if you heat the heads of the bolts with a torch first. You will not be able to re-use this skid plate with the TT or with any lift kit – Nth° makes a heavy duty replacement for this skid that is compatible with the 4-speed auto-specific TT and any amount of lift height (Nth1470x)

For the main skid, support the powertrain by placing a jack/stand under the double cardan joint on the rear drive shaft, then remove the four M8 (13mm head) trans mount nuts in the recessed slots near the center of the skid plate.

Be sure nothing else is attached to the skid plate such as auxiliary air lines or wiring, etc. then remove the six bolts that attach the plate to the frame rails ('97-'02 is 3/4" head, '03+ TJ = 18mm). The stock skid weighs over 40 lbs., so be prepared!

Step 4: Remove Stock Transmission Mount. The stock rubber mount and adapter bracket are not used with the TT.

- For manual transmissions and '03 4-speed autos, remove the four bolts that attach the bracket to the rear-underside of the transmission (5/8" heads) – there is no need to remove the isolator itself from the adapter bracket.
- For 3 speed auto trans (32RE), you must first remove the four nuts on the isolator to access the two bolts (5/8" heads) that hold the adapter bracket to the underside of the transmission tailhousing.

Once the bracket is loose, slide it rearward until the exhaust steady rest isolator slips off of the hanger pin (solid rod that is welded to the pipe ahead of the catalytic converter.)

Step 5: Remove exhaust hanger bushing. You will re-use the exhaust steady rest isolator bushing from the original bracket. To remove it, note that the rear (as it was installed on the Jeep) end of the isolator has a smaller lip on it than the front – push the isolator out from this end towards the front using a 3/4" socket (using a larger socket will shear off the small lip). Replace the isolator in the same orientation in the tube on the new bracket – it will be much easier if white-lithium grease is sprayed inside the tube. See **figure 1** for completed conversion orientation.

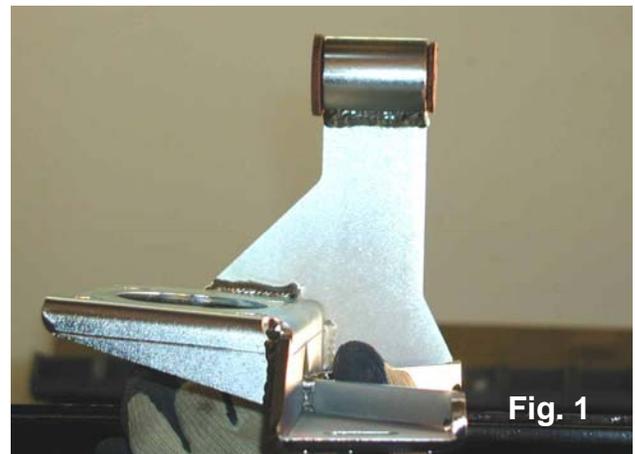


Fig. 1

Step 6: Pre-assemble New Transmission Mount Adapter Brackets. The new mount supplied with the TT has two parts – the main bracket to connect the two new isolators to the trans, and a bolt-on extension for the exhaust 'steady rest' tube. There are two main types of trans brackets: one for all factory autos, and one for all factory manual trans used with 4.0L engines (there is also a different bracket for AX-5 manuals). The exhaust extension comes in two styles: 'low' for '02-older vehicles, and 'high' for '03-06 TJs. Consult the **pictures below** to confirm that you have the correct brackets for your vehicle (trans

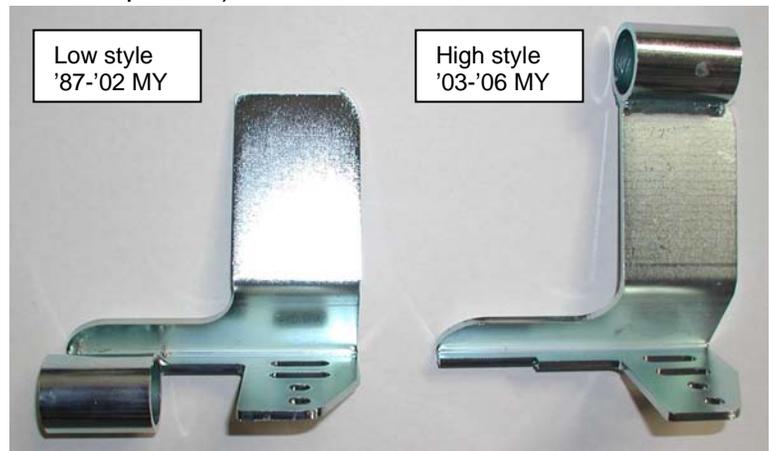


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brackets show the bottom side with front of vehicle at top of picture; exhaust brackets shown from 'trans side' of bracket with front of vehicle towards left side of picture.)

For pre-assembly, either extension can be bolted to either trans mount in two positions depending on your application: inboard (closer to trans) for use with Nth° long-arm suspensions, and outboard for 'stock position' to be used with Nth° short-arm or any other suspension systems. Pre-assemble the exhaust extension to the main bracket with one 3/8" x 1" bolt and nut through the appropriate non-slotted hole in the main bracket.

The isolators are mounted differently for the left (driver's) and right sides. For the driver's side, place a lock washer and then a flat washer on the remaining 3/8"x1" bolt, then pass the bolt from the top side of the slotted hole in the bracket and thread it into the hole on the top (rubber side) of the isolator.

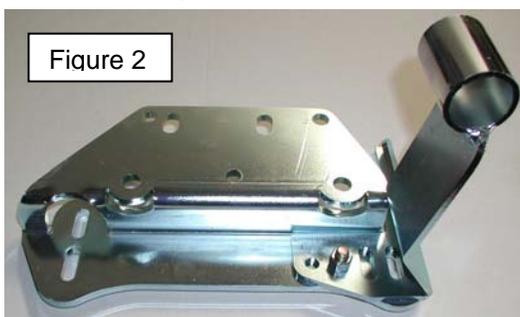


Note for 3-speed autos (A999) with a 2-speed Atlas t-case, you will use the forward slotted hole, all other applications will use the rearward slot that is directly across from the passenger-side slot.

For the passenger side, you must first drill out the threads in the center hole of the isolator to 3/8", then place the provided socket head bolt up through the drilled-out hole from the bottom of the isolator and press the head of the bolt into the hex-shaped void in the rubber. Position the isolator under the passenger-side slot and add the 'flag nut' to the bolt on the top side.

NOTE: If you are installing this TT with either an Nth° long-arm system or you have a motor mount lift, you will need to add 'shim washers' (large diameter washers supplied with this kit) between the top of the isolators and the bracket. For Nth° long-arm add two washers per side; for motor lifts add at least 3 per side – if you have both you will need 4-5 washers per side. This is necessary to keep the t-case from contacting the TT under the front-output area.

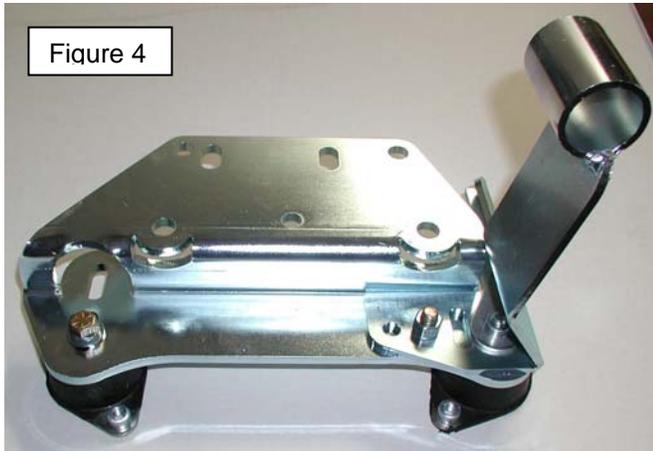
Figure 2 shows an auto bracket with a high-type exhaust extension in the Nth° long-arm (inboard position) – **Figure 3** shows a manual bracket with the low-type exhaust extension in the 'standard'



position – other combinations will look similar. Orient each isolator to roughly match the orientation of the holes on the TT skid and leave the bolts only finger tight for now as shown in **figure 4**.

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Step 7: Install the new Trans Mount Assembly to the trans in the same manner that the original one was



removed. This will be easiest if you increase the height of the jack under the transfer case output so that the trans is higher relative to the exhaust than it was stock. Start *all* bolts by hand, then torque to 50 ft-lbs. **Figure 5** shows a mount installed on a TJ Rubicon with 4-speed automatic – others will look similar.

Notes for specific transmissions

- AX-5, AX-15, & NV3550: For all manual transmissions, replace the original two or four bolts with the supplied 7/16x1”L flathead bolts. (Automatics re-use the original bolts.)
- NSG-370 (6-speed manual): Replace the original four bolts with the M10x25mm bolts provided – make sure to distinguish these from the 7/16” flathead bolts that look similar but will not fit!
- 32RE (A999) 3-speed: This trans uses just two bolts that will go into the two slotted holes in the bracket. For '97-02 TJs, keep the bolts at the back of these slots (so bracket is as far forward as possible).

Notes on Exhaust - Pin Modifications. A few TJ's will require some minor alteration of the exhaust hanger pin at the transmission mount – this hanger has changed often over the years, so while your model year will give you an idea if mods are needed, only a test fit will confirm exactly what must be done. Unless you've had custom exhaust work done, you should never need to rework the actual pipe, only the hanger. Check if these apply to you:

- Late '00 thru '02 TJ: You will likely need to remove some of the 'extra' lower rod so that it will not rest on the leading edge of the Tummy Tucker. The best approach is to use a sawzall to cut horizontally through the lower rod to remove the end of the rod as shown in **figure X**.
- '97-02 TJ: The exhaust hanger pin *may* need to be bent upward slightly ('97-'99 with 'flat cat' will usually be okay, '00-'02 TJ's with the more round 'fat cat' may or may not need bending). Do not bend the pin before you test-install the TT main skid plate. Only after the TT skid is in place will you know if it needs to be bent. When doing the clearance check after step 9, if the catalytic converter is hitting the floor, you need to bend the pin **up** to lower the catalyst – you may be able to do this in the Jeep, but it will go better if you lower the TT skid and remove the adapter bracket instead. Less than 5% of installations will require the rod to be bent (usually only if something caused it to bend previously – such a rock damage, etc.)

Step 8: Reposition T-case Shift Linkage Bracket. Because the TT raises the rear of the powertrain, the TJ's body-mounted T-case shift linkage geometry is affected. To correct it, you need to lower the powertrain-side pivot for the relay rod until it is again level with the body side.

- '97-02 TJ's, The factory bracket can be modified to correct the relay rod position: Pry the relay rod away from the trans until it pops out of the green plastic grommet in the bracket, then remove the upper two driver's-side t/case-to-trans nuts (9/16”) to remove the bracket. Tap the green grommet out of it's hole from the transmission side with a hammer and small socket. Next, locate and drill a new hole for the grommet – the hole should be 15/32” diameter and located at least 1.0” below the original hole (or as low as possible while maintaining 1/8” of material around the hole). Depending on

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models, there may be room for the hole to be forward slightly from the original hole (about 1/8" forward is ideal). **Figure 6** shows a modified bracket for a '97 TJ with 4.0L/AX-15 manual trans. If there is not enough material to locate the new hole forward, space the bracket forward when reinstalling by placing one 3/8" ID x 1/8" thick washer on each stud before the bracket.



Fig. 6

- '03+ TJ's, The transmission bracket is made from round stock with 'smashed' end tabs and a flattened area for the green grommet. You should have been supplied with a small plate and u-bolt that were included with the transmission adapter bracket. Remove the stock bracket and grommet as described for '97-02 TJ's, then attach the plate to the stock bracket using the supplied 7/16" bolt. The plate goes on the transmission side of the factory bracket; place the bolt through the large round hole in the plate (the one with more material around the hole), then the original grommet hole (from the non-trans side) and as shown in **figure 7**. Next place the small u-bolt over the lower leg of the stock bracket and through the two slotted holes in the plate – secure with washers and nuts on the plate side. Install the green grommet into the new hole on the plate from the non-trans side. Re-install the bracket/plate assembly to the t-case bolts.

Snap the relay rod end into the green grommet. After installing the TT skid in step 9, you should be able to confirm that the rod is roughly horizontal again – this is the key to allowing the linkage to work properly and be able to select all ranges without binding or interference.



Fig. 7

Step 9: Attach TT Main Skid Plate. Elevate the powertrain all the way up against the floor for this step. Confirm that you were supplied the correct fasteners laying the threaded portion of one against the threads of an original bolt – they must 'mesh' exactly ('97-02 TJ's use 1/2-13 SAE bolts; '03-06 TJ's use M12 bolts). Some TT's are made to fit multiple models of Wranglers, and have multiple sets of holes along the frame rails. If your TT has two sets of holes, you must have an '97-02 TJ - align the rearward hole of each front pair to your first frame holes and the rest should line up (the right-rear will actually be the forward hole for that pair - the other 6 holes are for YJ frames). Once the TT is positioned (make sure the isolators didn't hang up on the ribs) line up the countersunk holes with the frame holes and *hand-thread all six flathead bolts*.

NOTE: Frame Hole Alignment: Wrangler frame rails are naturally twisted inward at the bottom due to the weight of the body pushing down at the body mounts – this causes the holes for the skid to shift closer together than they were intended. The TT is designed to original Jeep CAD dimensions – and so will hold the frame rails in place and keep your body mounts from sagging, but during installation, it may appear that the skid is slightly too wide – this is normal.

To make it easiest to get all six bolts started, do not set any of the bolts into their countersinks until they are *all* started – then snug them up with a wrench. After the clearance check below, torque to 75 ft-lbs.

NOTE: We recommend applying anti-seize compound to the conical shoulder of the bolts (not just the threads) to make them easier to remove later. Without this, the bolts can 'bite into' the powdercoat in the countersunk holes of the TT and become difficult to remove.

Clearance Check: Due to variations between vehicles, a few installations may need to 'shim' the isolators to keep the transfer case from resting or bouncing on the TT. At this point, you can determine if this is necessary by letting the jack under the t/case output down until the full weight of the powertrain is

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resting on the new isolators. By viewing through the t-case drain hole at the left-rear of the TT, observe the amount of clearance between the lowest point of the t-case and the TT – you may use pieces of steel, etc. of known thickness to gage the gap. If the gap is less than ¼", you should add the thin 3/8" fender washers to the top of each isolator (you will probably have to lower the TT skid to do this easily - be sure to shim both isolators the same amount!). You will gain a little more clearance than the thickness of washers you add – a 1/8" thick washer will give about +3/16" of additional clearance.

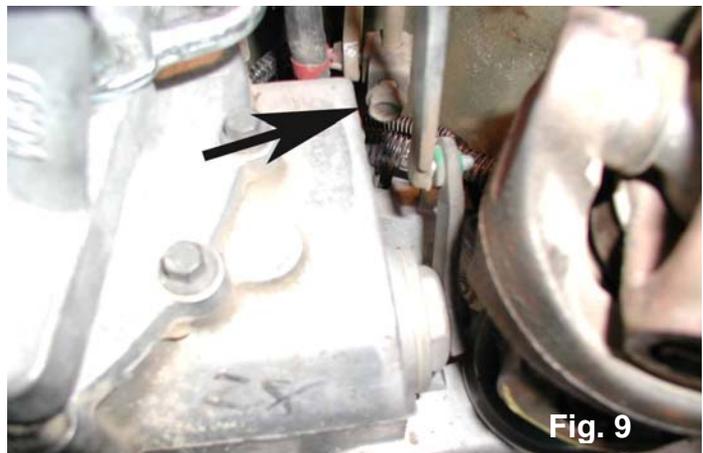
T-case Clearance Notes:

- TT installations with an NV231-type transfer case as covered here do not require floor modifications.
- If you're using a body lift *and* motor mount lift, you will probably need about 1/4" of washer-shims as noted above to keep the t-case from resting on the TT skid.
- TT's generally will not fit with a motor mount lift and *no* body lift – some transmission bellhousings will hit the top-front of the tunnel. You *may* be able to make clearance, but Nth° does not consider this a normal installation.
- '03 TJ's with the 42RLE 4-speed auto will usually require clearancing between the top of the bellhousing and the floor/tunnel. There is a longitudinal rib on the top of the bellhousing that may touch the lateral 'pinch flange' on the body where the dash panel ('firewall') meets the tunnel. The body flange can be bent up out of the way using a long pry bar from the driver's side. You will know on the test drive if this area is rubbing!

Step 10: Attach Isolators to TT. With the powertrain resting on the TT, check to see if the threaded holes in the isolators are visible through the corresponding countersunk holes in the TT skid. If they are not, jack up the powertrain at the t-case output again to take some of the load off of the isolators, then reach above the TT skid and slide and/or twist them until the holes roughly line up, then lower the powertrain fully onto the TT again. Now align the holes enough to start the bolts by inserting a small screwdriver through the TT holes and prying the isolators as shown in **figure 8** until each hole lines up, then start a 5/16" flathead bolt *by hand* into the nuts on each isolator. It helps to get one bolt started in each isolator before trying to pry/align the other hole. Once all four bolts are started, torque them to 25 ft-lbs.



Step 11: Adjust T-case linkage. Even though the t-case linkage relay rod position has been corrected for the TT installation, you will still need to re-adjust the linkage for proper t-case shifting. Begin by loosening the ½"-headed lock screw on the upper link (the one attached to the lever coming from the handle inside the Jeep – see **figure 9**) – make sure that it slides easily on the rod. Next, manually shift the t-case into 4-Low by pushing the t-case-mounted lever all the way to the back (you may gently confirm that it is engaged by starting and running the Jeep a few feet – but no driving! Make sure the in-cab lever is in the 4-Low position, but has some clearance to the back of the plastic bezel, then re-tighten the lock screw. You can confirm proper shifting after the install is complete and repeat this procedure if necessary.



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Step 12: Final Clearance Checks and Adjustments. Now that the TT is bolted up, you can determine if adjustments are necessary by letting the jack under the t/case output down until the full weight of the powertrain is resting on the new isolators. The most important clearance is above and below the t-case front output because this area moves the most under load. By viewing through the t-case drain hole at the left-rear of the TT, observe the amount of clearance between the lowest point of the t-case and the TT – you may use pieces of steel, etc. of known thickness to gage the gap. Due to variations between vehicles, a few installations may need to ‘shim’ the isolators to keep the transfer case from resting or bouncing on the TT. Several 3/8” hole x 1.5” diameter ‘fender’ washers were supplied for this purpose and must be used in pairs on top of each isolator. If you need to add shims, you will probably have to lower the TT skid to do this easily. You will gain a little more clearance than the thickness of washers you add – each pair of .090” thick washers will generate about +1/8” (.125”) of additional gap.

Proper installation of your TT with a NV231 will have at least ¼” of space under the front output, and well over 3/8” above it to the floor. If there is less than ¼” below the t/case, you need to add shims above the isolators.

At this point you should also check for adequate clearances all the way around the transmission, transfer case, and exhaust/catalytic converter. Generally there should be at least ¼” of space at all close gaps between the floor or the TT and these components – if not, the appendix may provide help/solutions.

Specific Clearance Notes:

- '03 TJ's with the 42RLE 4-speed auto *require* clearancing between the top of the bellhousing and the floor/tunnel. There is a longitudinal rib on the top of the bellhousing that will be touching the lateral ‘pinch flange’ on the body where the dash panel (‘firewall’) meets the tunnel. The body flange can be bent up out of the way using a long pry bar, etc. from the driver's side – you will need to hammer the end of the bar to move the flange out of contact.
- If you're using a 1.25” drop TT with a body lift *and* motor mount lift, you will probably need about 3/16” of washer-shims above the isolators to keep the t/case from resting on the TT under the front output. Also don't forget to check your cooling fan's clearance in the fan shroud (adjustments for this are not provided with the TT – they should have come with your body lift).
- 1.25” drop TT's generally will *not* fit with a motor mount lift and *no* body lift – the transmission bellhousing will hit the top-front of the tunnel. It may be possible to make tunnel modifications to allow this combination, but you are on your own!
- Flat TT's *require both* a body lift and motor mount lift – see the Appendix for details.

Step 13: Final Assembly. If all static clearances are at least ¼”, you may tighten the 3/8” bolts (9/16” head) on the top of each isolator. These can be difficult to reach, but will only have to be done once since subsequent removal of the TT can be done at the four 5/16” flathead bolts under the isolators. The driver's side bolt is easiest to reach from the front of the TT (under the front driveshaft). The passenger side bolt is usually easiest to reach from the rear (between the t-case and catalyst or sometimes *over* the pipe behind the catalyst), but on manuals may be accessible from the front as well.

Step 14: Readjust Rear Axle Pinion Angle. Since all TT's raise the t-case position relative to the chassis for maximum clearance – your rear driveshaft angle is increased as compared to before the TT installation – this is due to not only raising the output, but also ‘flattening’ the powertrain angle (this angle remains close to stock if you use a drop TT with a motor mount lift.) Both your operating angle and ideal nominal length are affected by installing a TT: the 1.25” drop TT version raises the rear output by nearly 1.5” versus stock. Generally installation of a TT does not require a longer CV driveshaft than the one already installed. It is assumed that a proper length ‘CV’ drive shaft is already installed, but you will now need to readjust the rear axle pinion angle higher with the TT versus with the stock skid plate. This adjustment requires the use of an Nth° Stinger or Nth adjustable rear upper control arms (or others that may have come with your lift kit.) Ideal pinion angle is usually about 1.5+/-0.5 degrees ‘flatter’ than the drive shaft's angle relative to the ground.

Once you have readjusted the pinion angle, you should measure the relative angle between the driveshaft and the powertrain (t-case) – this is the ‘operating angle’ of the double Cardan joint. You can

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get a powertrain angle from various places such as the driveshaft output flange or engine damper pulley, but do not use the engine or transmission oil pans – they are not accurate enough. The double-Cardan joint on your custom rear drive shaft cannot run vibration-free if its operating angle is over 22 degrees. If it is, you will likely need to make changes to solve vibrations – consult the appendix for more information.

DO NOT use a torch or plasma cutter, etc. to clearance the isolator housing because you will light the rubber on fire and need a new shifter cane!

Step 15: Shifter Clearance Modification – ‘04+ Manual Transmission Vehicles Only. Late in the 2003 model year, Jeep and New Venture Gear changed the design of the shifter cane isolator, so the following procedure applies to all ‘04+ models and a few ‘03 Wranglers (if you have a body and motor mount lift, you probably will not require this step).

Like the old design, the new shifter ‘cane’ has a large rubber isolator encased in a metal housing, but the new design can be identified by the fact that this isolator is in *front* of the main shaft (instead of in line with it), and attaches via a bolt down the center of the isolator. With the TT installed, this new oversized-and-forward-mounted isolator will hit the surrounding plastic of the center console when the trans is in 1st, 3rd, and maybe even 5th gears – this will cause the transmission to ‘pop’ out of these gears under high-rpm load unless corrected.

To correct the issue, first loosen the shifter boot base from the center console by *gently* squeezing the plastic frame at the base of the boot in the center of the front and back surfaces until it comes free. You will now be able to see where the interference occurs when you place the trans in 1st gear – mark this area on the front side of the shifter isolator’s metal housing. Next, remove the upper portion of the shifter along with the isolator by removing the vertical bolt that goes down through the top of the isolator. Use any type of grinder to create a ‘window’ in the front of the housing and into the rubber approximately ¼” deep - this will not adversely affect the function of the isolator or its integrity, but will provide the needed clearance as shown in **figure X**. Once clearanced, reinstall the shifter for the next step, but reinstall the boot after the test drive.

Step 16: Test Drive. Once all fasteners are properly torqued and all supports removed, test drive the Jeep to check for vibrations or clearance issues, but *before* you start the engine, make sure to check for clearance between the engine cooling fan and the bottom of the shroud. If the fan is ‘stuck’ on the shroud or very close to it (under ¼”), go to the appendix for the solution first.

When you start the engine, you may notice 3-4 ‘jolts’ just as the engine starts running. This is normal and is a result of the new dual-mount system you installed with the TT. It is a small trade-off for the additional control over powertrain motion that the dual mounts provide -which in turn keeps the trans/t-case position under control so that they don’t knock against the tunnel, TT, etc. Once running, you should not feel or hear any new ‘buzzing’ or rattling. If you do, this indicates contact between the powertrain and the TT or body floor. Find the contact and correct as necessary with shims, more floor mods, etc. (see appendix). Contact during certain rough conditions may occur and is generally not detrimental – you can test for some things by doing hard launches (t-case may touch floor), and compression braking (t-case may touch TT) – if the contact is detectable, it may be desirable to increase the appropriate clearance area. You can also test drive over washboard, but the contact will be hard to hear – if you provided the proper ¼+” clearances, you will rarely hit and not damage anything.

Next, confirm that the t-case shift linkage still functions properly – that you can get into and out of both 2-High and 4-Low. If not, the linkage may need readjustment.

Note: if you have an automatic and hear 3-4 ‘thumps’ during a hard launch, these are due to the torque ‘pulses’ created by the torque converter, which are moving the t-case front output up high enough to touch the floor – this should never occur with your NV231 t-case and means your t-case is shimmed too high (see appendix).

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Caution: Debris Accumulation on top of TT. The TT does not have any large clearance or drainage holes on the bottom surface to eliminate the possibility of snagging a rock, etc. in such holes. On the other hand, the lack of holes and the reduced clearances around the transmission, transfer case, and exhaust, makes it easier for rocks, twigs, etc. to accumulate on top of the skid plate and not fall out on their own. Flammable items such as grass and twigs should be kept out of contact with the hot exhaust or there will be risk of fire – you should clear the TT after each off-road outing to avoid danger!

Also, (especially on manual transmissions), rocks or other hard items may get lodged under the transmission adapter bracket – where they will effectively eliminate the isolation proved by the dual mounts (you may notice more vibration), and if left uncleared this could cause the mounts to deteriorate. Every effort has been made to prevent this from happening, but you should check for rocks and clear them if found.

Appendix: Installation Issues and Additional Modification Solutions

Issue: Vibration while driving. Since drive shaft angles and related vibrations are affected by many factors besides the TT, including lift height, etc., Nth Degree does not include the means to correct driveline angles with any TT kit and full-price returns are not granted for vibration issues. If you have any suspension lift on your Wrangler at all, you *must* have a double Cardan rear drive shaft and a means to adjust your rear axle pinion angle.

Be sure the vibration is not out-of-balance tires, etc. by noting the ‘speed’ of the vibration – tire vibrations are much slower than drive shafts due to the axle ratio. Also, an out-of-balance drive shaft (due to lost weights or bent, etc.) will vibrate steadily and the intensity will increase evenly with vehicle speed (like a tire, but faster as mentioned). Vibrations due to bad joint angles will generally have speed ranges where the vibration intensifies and others where it nearly disappears. Also an angle-induced vibration will be cyclical – it will ‘drone’ in and out at a given vehicle speed. If you have issues and don’t know what to do, here are some tips:

Solution Suggestions: In *general*, if your suspension lift height is under +5” and you have a double cardan drive shaft, and a (standard) low pinion rear axle, you should be able to cure most drive shaft angle-related vibration issues below 80 mph by fine-tuning the pinion angle. However, tire size, axle ratio, etc. are also factors, so the ‘solution’ may not be as simple as pinion angle. If you are using relatively small tires for your axle ratio (such as 33’s with 4.56 gears), your driveshaft spins faster at a given speed and makes eliminating vibrations harder. Some steps to diagnose the problem after verifying it is not a balance issue:

First, confirm that your relative joint angle at the axle pinion joint is about 1.5 degrees, with the pinion flatter than the driveshaft – if not, correct this first. Second, check the relative angle at the t-case end – it should be no more than 22 degrees. If it is more, you may have to choose a combination of ways to reduce the angle - these can include: shimming the TT down at the frame, adding/increasing the motor mount lift, lowering the lift height, using a high pinion rear axle, or installing a special high-operating-angle drive shaft such as a Bigelow/Cornay joint (not just a ‘clearanced’ joint). If you are using a custom driveshaft that uses an adapter to the factory output flange, you can also reduce the angle by 1-2 degrees or more by changing to a yoke-type output and eliminating the damper and flange – this will require a new driveshaft that has a yoke-type CV joint and can be about 1.5” longer than the flange-type CV driveshaft.

If you are having a vibration issue that is dependent on your driving (turning left, accelerating hard, etc.), the issue may not be angles but contact somewhere between rotating parts and non-rotating ones – or light contact to the body floor. Check for clearance around both drive shafts including screws protruding from the floor, etc. Keep in mind that the t-case front output rises during acceleration (may touch floor) and drops during compression braking (may touch TT). If you have an automatic and feel 3

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to 4 mild 'thumps' during a hard launch from standing still that seem to come from right under the driver's seat, you need more clearance at the dimple from step 4.

Issue: Vibration while Idling. If you notice significantly more vibration while sitting still with the engine running, the issue is most likely that there is contact somewhere between the powertrain and the body floor or TT. These should have been caught and corrected in step 12, but something may have been overlooked or too hidden to detect visually.

Solution Suggestions: Thoroughly inspect the area above the TT for any contact between parts that was missed previously. On 4 speed automatics, especially check the clearance above the bellhousing as mentioned in step 4a.

Also check the t-case linkage relay rod and confirm that it is not bound up or plunged to the point where it is contacting the tunnel through the tunnel-end bracket. If the linkage is not close to horizontal, it may be binding and the vibration is then transmitted to the interior through the rod. You can try disconnecting the relay rod to test if it is the 'noise path'.

Another possibility is wrong or incorrectly installed isolators. Make sure that the isolators are sitting flat on the TT and have a uniform, slightly conical shape. If they appear distorted to one side, front, or back, or are otherwise unevenly shaped, there is an unnatural preload on them that should not be present – check for crooked/misinstalled/bent brackets, bad motor mounts or motor mount spacing, etc. If their appearance is okay, verify their height while they are supporting the powertrain with the engine off. They should be about 1.0" to 1-1/16" tall from the surface of the TT to their tops (not counting any shims above them) – if the height is more (about 1-1/8"), you may have isolators that are too stiff (standard TT isolators are marked with one paint dot on their undersides, but stiffer isolators for custom installations exist and have multiple paint dots).

Issue: Exhaust is too high over rear axle and at tailpipe and the hangers at muffler and tailpipe are not 'hanging' and/or exhaust is touching heat shield over rear axle. Since the TT installation does slightly elevate the center portion of the exhaust relative to the floor, the rear portion may require adjustment to keep it in its proper place. If this did not happen 'naturally' via some 'sag' at the joint between the catalytic converter and the muffler, you may need to make this adjustment deliberately.

Solution: On newer TJ's there is a joint in the system made up of two large flanges that are held together with two bolts. This connection is above the right-rear portion of the TT ahead of the muffler. By loosening the two bolts, the exhaust should drop back into place, then retighten the bolts. If the hanger at the back of the muffler is still not fully 'hanging', bend the rod that is welded to the exhaust pipe slightly forward. The exhaust grows in length when it warms up, so the hanger will swing into position during operation.

If your factory exhaust system has a 'slip joint' and a muffler clamp ahead of the muffler, you have two options: 1) If the clamp can be loosened and there is not too much 'crimp' in the tube (indentation from the clamp), you should be able to adjust the angle of the muffler and retighten the clamp. 2) You may be able to simply bend the muffler/tailpipe down by prying/hanging on it to get the joint to shift. This may not be a desirable method if your system is old and/or rusty as it may weaken the pipes and lead to exhaust system failures.

If your exhaust system is custom, you may or may not have a joint ahead of the muffler and it may be necessary to visit a muffler shop to do a proper adjustment.

Issue: Engine Fan is touching fan shroud (static), or fan can be heard touching shroud while driving over bumps, etc. Wrangler front-end sheetmetal is only supported by *one* body mount forward of the firewall, consequently, there can be major variation (up to an inch!) in the position of the grille along with the radiator and fan shroud. Normal TT installations tip the powertrain 'flatter' to the point where the engine fan may touch the bottom lip of the fan shroud if the sheetmetal on your Jeep happens to be 'high'. You need at least ¼" clearance between the tips of the blades and the shroud, though more is desirable - if you have less, you need to fix it.

Solution: The easiest solution is to lower the fan shroud. Remove the shroud from the radiator and slip it over the fan (you may have to unbolt the fan to do this). Use a small round file or similar to 'router' the

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mounting holes upward towards the top of the shroud. If you cannot gain enough clearance before the holes are too close to the ribs in the shroud, you can also do the same to the radiator mounting flanges where it bolts to the grille, but this is almost never necessary for drop TT installations. Not that if you are using a body lift without a motor mount lift, you already had to make a fan shroud correction that may have not been sufficient for use with the TT. Flat TT installations will usually require some adjustment of shroud position depending on the amount of body and motor lift used.

Issue: Manual transmission sometimes pops out of first gear. If you have a late production 2003 Wrangler or have a '00-'03 that has the NV3550 transmission and have had transmission work done, the dealer may have updated your shifter to the new design described in step 18, and you will need to perform that step. If you have an '04+ Rubicon and did not perform step 18, this problem confirms that you need to do it.

If you have an older Wrangler, this issue should not occur, but if so, read on.

Solution: Snap the rubber boot around the bottom of the shift lever loose from the center console bezel. Underneath you will see a 'fat' area on the shifter cane – this is both the connection of the lever to the stub from the transmission, and a large rubber isolator. You will likely find that this 'fat' area is now high enough in the opening that it now can touch the front of the console opening when in 1st, 3rd, or 5th. The solution is to grind a small amount of the metal housing away on the front side of the isolator (removing material from the plastic console opening will usually not work since there is a plastic frame around the base of the boot which is necessary to snap the boot in place). Mark the appropriate area to be ground and remove the shifter by loosening the set screw on one side. Grind the metal away down to the rubber, but do not remove much if any of the rubber itself. DO NOT use a torch or plasma cutter to do this – you will light the rubber on fire and need a new shifter! Reinstall the shifter and test to confirm the fix, then snap the boot down if the problem is solved.