

Introduction

This guide will show the installation of the Novak #453 adaptation ring to the Dana 300 transfer case.

About the NV4500 Transmission

The NV4500 or New Venture Gear 4500 is a heavy-duty, manual shift, five-speed overdrive, longitudinally positioned transmission.

History

New Venture gear was the somewhat unlikely merging of the two manual shift design & manufacturing divisions of General Motors and Chrysler Corp. The Muncie (or Stewart Muncie) division of GM and the New Process division of Chrysler became New Venture and one of the first fruits of this union was the NV4500.

The NV4500 was first released in Chevy / GM trucks from 1993 and then into Dodge trucks in 1995. Though it has its roots as the New Process 4500 four-speed beginning as early as 1972 in Dodge trucks, its current incarnation as we know it today is quite different.

Identification

The NV 4500 is a top loading five-speed transmission with a cast iron case, aluminum top cover and dual PTO ports. It features all helical gears, and is fully synchronized. The NV4500 has a case length of 12.37" and an extension housing length of 6.5". This housing contains fifth gear. As usual, 2wd style housings are longer.

A unique feature of the NV4500 is its fly-weighted 1st-to-2nd gear synchro assembly, preventing a downshift at excessive revs. Its unique synchro ring composition requires a special synthetic lubricant.

Engine Compatibility and Adaptability

The NV4500 is found in GMC & Dodge trucks. The bellhousing pattern for 1993-1994 GM versions is unique from the later (1995-) GM and Dodge units. The 1993 and 1994 Chevy versions have a lower first gear of 6.34:1 and an unsynchronized reverse gear. Transmissions after this period have a higher 5.61 low ratio and reverse gear synchronization.

Input shafts for the GM and Dodge units have 10 splines with 1-1/8" diameter. GM shafts stick out their usual 6-5/8" while the Dodge units are 7-5/8" long.

About the Conversion

The Adapter

The Novak NV4500 to Jeep Model 300 transfer case adapter is very compact at only 7/8" long for a combined transmission and adapter length of 19.9". The adapter itself is cast and machined of a high-grade aluminum alloy, featuring a thick flange and a heavy cross-section.

NV4500 Versions

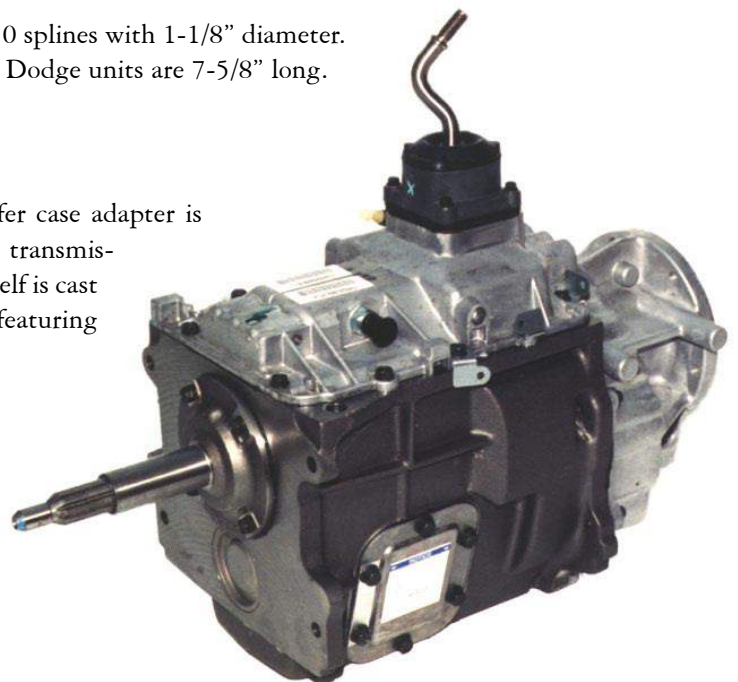
Only the GM 4wd version of the NV4500, 1993- can be adapted to the Dana 300. This transmission is identified by its 32 spline output shaft and its six-bolt, round tailhousing adapter pattern.

Transfer Case Versions

All Jeep models of the Dana 300 transfer



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cases are compatible with this adapter assembly. IH versions of these transfer cases are not compatible.

Transfer Case Input Shaft

The included Dana 300 input shaft is machined from triple-alloy gear steel. This 32 spline version installs easily and quickly, replacing the factory 23 spline input shaft for a direct connection to the 4wd style transmission output shaft, as discussed above.

Transfer Case Strength and Condition

The Dana 300 transfer case is well matched to the 4500. The 300 is uncommonly strong, compact and servicable. They are capable of power ranging up through V6s, V8s and even the Chevy Big Blocks.

It is not requisite that you rebuild your transfer case to successfully complete the conversion, but it may be a good time to do so if your transfer case leaks or has many miles of service. We've made our Dana 300 gaskets & seals kits and our all-inclusive master rebuild kits available for this purpose.

Transfer Case Shifter

This transmission conversion will allow for the retention of the factory shifters, or allow you to upgrade to a twin-stick shifter.

Transmission Shifter

Use of the OEM style transmission shifter for the 4500 is easily done. The installer may opt to bend the stick to fit the particular Jeep application.

Clocking Information & Driveshaft Clearance

This adapter is drilled for optimal transfer case angle versus driveshaft clearance. The pan of the Dana 300 will not hang any lower than the bottom of the transmission case.

Driveshafts

Driveshaft length changes are often required, as this geartrain combination is virtually always longer than some factory Jeep combinations. Some GM engine installations sit further ahead in the bay and will allow for better driveshaft angles than with AMC installations.

Some of our customers, fearful at the perceived expense of new or modified driveshafts, attempt to let the existing driveshafts dictate engine, transmission and transfer case location, sometimes to the detriment of the project. Driveshaft modifications are usually inexpensive when performed by driveline, RV or tractor implement specialists. New driveshafts are an option but seldom a requirement in regards to the actual successful conversion. Jeeps that require extensive travel or specialty-built driveshafts have this option available through several fabricators across the nation.

Engines & Engine Mounting

An NV4500 installation is often done in conjunction with an engine conversion into the Jeep. These engines include the Chevrolet Small Block V6 & V8, from Generations I, II, & III, 1955-2006. Carbureted, TBI and TPI engines are all compatible with this transmission.

In any scenario, it is often preferable that the engine be installed (as the Jeep engines usually are) with an offset of 1" to 1-1/2" to the driver's side. Other engine mounts on the market - especially the bolt-in versions - do not take this into account and make other placement decisions for the installer that do not take the full powertrain into account. Novak offers what we have found to be the most intelligent engine mounting system for Jeeps available, allowing the installer to make an easy and satisfying decision as to powertrain placement with the 4500 and the Dana 300 both considered.

Axles

Use of factory axles is completely acceptable with this conversion. Axle upgrades are not necessary, but they may be chosen for reasons external to this transmission upgrade.

Conversion Procedure

First, you should trial fit the new input shaft to the transmission output shaft to verify proper spline fit. Pay particular attention to the spined shafts and how they mate up. There is a certain amount of variation in factory shafts due to wear and other factors. We have splined our shaft tight enough to minimize both wear and the risks of breakage. Make sure your output shaft splines are clean and free of rust. You may need to polish or clean the factory splines. Do make sure they slide nicely together and by hand. If the shaft mating seems somewhat loose, remember that the involute form of splines cause the two shafts to self-center when transferring power.

Removing the Transfer Case Input Shaft

If applicable as described above, replace your Dana 300 input shaft. Removal and disassembly of the input retainer assembly is required. This is a simple process and is done as follows:



Having removed the transfer case from the transmission and the Jeep, drain its fluid and bench the transfer case.

Remove the two studs from the mounting face of the transfer case. Some transfer cases use six bolts instead of studs. Next, remove the six

Dana 300 4:1 Low Gears Caveat

4:1 gearsets will require an additional step over the factory Dana 300 gearset. The input shaft and gear assembly cannot be pulled out of the front of the case bore unless the intermediate gear has been removed. This will require that the transfer case bottom pan be removed, and the intermediate idler shaft be removed by being driven out *rearward*.

Once this step is completed, you will be able to remove your input gear assembly and proceed as directed.

socket head bolts from the transfer case input bearing cap using a 3/16" hex (Allen®) wrench. Gently tap the retainer with a soft mallet to break any adherence to the transfer case bore.

Carefully pry the front bearing cap assembly from the transfer case using screw drivers or pry bars. You will notice that there are two notches for this purpose. It will remove as a unit consisting of the input gear, shaft, bearing, seal and retainer. Nothing should fall apart or out of the transfer case.

Disassemble the front retainer by removing the rear snap ring. Now remove the gear. These splines are not usually overly tight and removal should be easy.

With the gear removed, now remove the large retaining ring that holds the bearing in the retainer bore. Remove the shaft with its bearing. Press the bearing off the shaft. If the input bearing in the Dana 300 retainer is to be





replaced, now is the time.

Input Seal Replacement

You will be replacing the unidirectional factory input seal on the Dana 300 with our provided bidirectional seal. This clever design will keep the transfer case and transmission fluids totally separate from each other, without having to resort to the use of a sealed bearing, which does not receive the benefit of the cooling and flushing effects of the transfer case fluids.



Remove the factory seal with a seal puller. Clean the seal bore with a mild abrasive and solvent as necessary.

Install the new seal squarely and gently, being careful not to deform it as you press it in.

Installing the New Transfer Case Input Shaft

Set the old input shaft aside and get the new one. As with all splines, test fit the Dana 300 input gear splines to the shaft. Fit should be snug, but not exorbitantly tight.



Dana used shims on the shoulder of the input shaft to prevent the helical gear from thrusting up and down the input shaft while under substantial its forces. Your goal here is to totally minimize the gear's end play. As a rule of thumb, install as many shims as

possible and still be able to install the gear's retaining ring. It is easiest to set this up empirically, using calipers. You will measure the input shaft from the bearing shoulder to the rear of the retaining ring groove, as shown in the image. You should get 2.498" to 2.501". Now measure the stackup, including: the input bearing, input gear, snap ring and shims. Add or remove shims until you have acheived a number just .001" to .003" shy of this ~2.500" measurement. You can then proceed with the assembly of the input shaft assembly.



Install your shims on the input bearing journal. Press the input bearing on the input shaft. Then lube the seal and shaft on the seal journal. Press the shaft and bearing assembly into the retainer and install the retaining ring, which should just snap into the groove, assuredly but with a bit of drag if you've set up





your shims correctly.

Put a thin coat of assembly lube on the male and female splines of the input shaft that engage the transfer case input gear splines and transmission output shaft splines. This protects the splines during the initial run. We do not recommend the use of grease, as it could foul the flow in manual and especially automatic transmissions, causing significant damage.

Install the input gear on the input shaft. Remember that the helical teeth face forward and the clutch teeth face rearward. Follow up by installing the gear-to-shaft snap ring. The transfer case input assembly should now be

completely assembled.

Transfer Case Face Preparation



Prepare the transfer case for assembly to the adapter by cleaning the transfer case surface with sandpaper and a small block of wood. Sand the mounting face of the transfer case until it is absolutely clean of dirt and rust. This step is important to insure a proper seal between the adapter and transfer case. The Jeep factory adapter did not use a gasket at this location and the mounting face of the transfer case may have accumulated a considerable amount of rust and dirt.

Input Shaft Assembly Installation

For an extra measure of sealing, you may wish to install a small bead of RTV

or other sealant to the flange / journal of the input bearing retainer. Now insert the input shaft assembly into the input bore of the transfer case. Rotate the retainer until the bolt holes align. Lightly and squarely tap the retainer into place until it seats. Thread in the six socket head bolts into the transfer case. Do not use these bolts to seat the retainer. If there is any obstruction, eliminate it and retry.



We've had many customers request it, and we've made available our Dana Model 300 Master Rebuild, kit #300MR, plus several other components for the 300. We welcome you to call us or see our website for details.

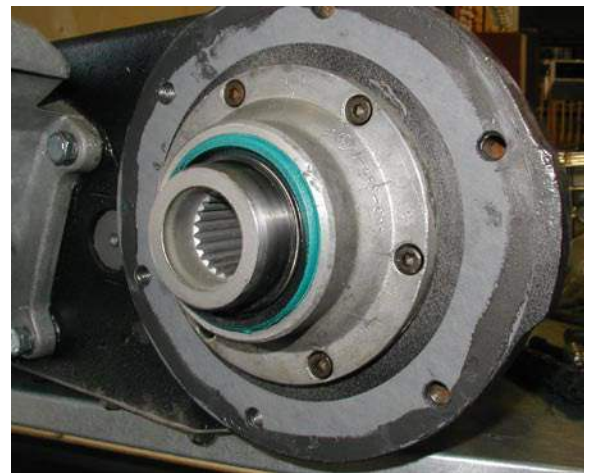
Full disassembly of the D300 is not required for this conversion, but many individuals wanting an entirely fresh and optimized powertrain find this a good time to do so.

Torque the bolts evenly and in three sequential stages to 7-8 ft. lbs.

Adapter Installation

The six bolt holes in the face of the transfer case are phased to prevent installation in all but one orientation. Align one of the provided gaskets to these holes. Then, coat the mating face of the transfer case with RTV to obtain the best fluid seal possible, but don't overdo it. Now, stick the aligned gasket to the face.

Install the #453 adapter with the engraved arrow up. Install the provided socket head bolts and thread them into the transfer case. Tighten the bolts evenly and lightly, just until the RTV begins to squeeze out. Allow the RTV to cure for a couple of hours and then follow up with an even and sequential cross-tightening of the six bolts to a final torque of ~38 ft. lbs.



Transfer Case Installation

Thread the provided studs into the adapter and test fit to your transmission. We recommend the use of a drop of Loctite Blue on each stud going into the aluminum. Install the second provided gasket with RTV in a similar manner as done earlier. Install the assembly to your transmission. Slip the six lock washers onto the studs and thread on the nuts.

Allow the RTV to cure for a couple of hours and then follow up with an even and sequential cross-tightening of the six bolts to a final torque of ~38 ft. lbs.

Drivetrain Positioning

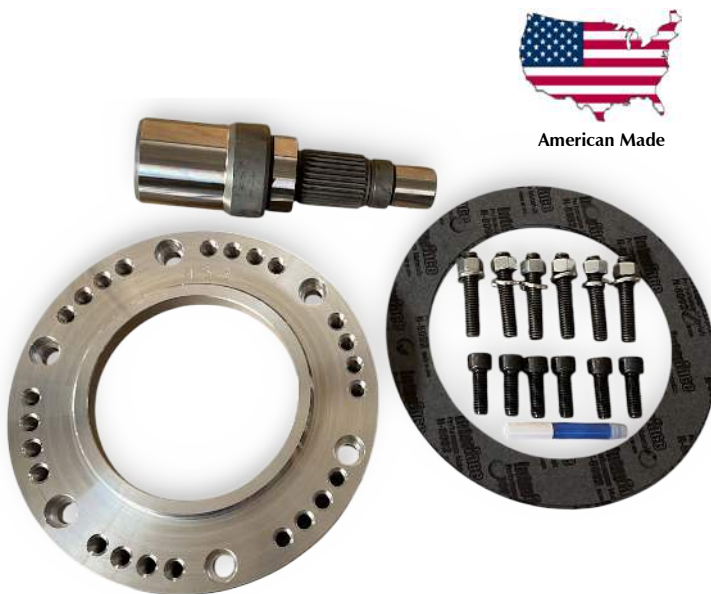
There is a wide array of situations in which our customers employ this conversion. However, the factory transmission mount under the OEM adapter will usually provide a good mounting location for a variety of installations. Use of a Chevy rear mount unit indicated for the 4500 and will facilitate this.

Any change in positioning may necessitate modifications to the 4500 shifter.

Conclusion

While reading through these instructions, and especially while performing the transmission swap, it is often recognized that it is not the swap itself that provides the greatest difficulty, but in the ancillary things like linkages, mounts, clearances, and the like. Any good installation should consider all the points in this article and also allow for time, energy and funds for the dozens of variations in drivetrain conversions that cannot be anticipated.

We strongly suggest that you keep these instructions and the following, associated parts list for future reference. For questions concerning your conversion, contact us and we'll be happy to assist.



Novak Kit #453 includes:

- ☐ Adapter, #453 (1)
- ☐ Gasket, six bolt front transfer cases (2)
- ☐ Washer, split lock, 3/8 (6)
- ☐ Stud, 3/8-16 x 2", fully threaded (6)
- ☐ Bolt, 3/8-16 x 1, hex socket, standard (6)
- ☐ Nut, 3/8-16, hex, grade 5, zinc plated (6)
- ☐ Seal, oil, double lipped, bidirectional (1)
- ☐ Threadlocker, Loctite 242 blue, .5ml (1)
- ☐ Instructions

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www.novak-adapt.com

support@novak-adapt.com

877.602.1500

About Your Novak Adapter

The Novak #453 adapter kit is built to high standards of design, materials and build. The adapter housing is machined from 6061-T6 aluminum for remarkable strength. Our adapter shaft (if ordered) is machined of a triple-alloy gear steel, specially hardened and precision ground for strength and longevity.

The design of this adapter is such that it precludes the need to buy a special transfer case front output yoke.

Novak warrants your adapter and shaft against defects of workmanship and materials for the life of the vehicle. This warranty is non-transferable and requires a copy of your invoice as documentation. These components are not warranted against damage or defects resulting from improper installation, including misalignment, improper assembly, improper mounting, or incorrect driveshaft lengths, and miscalculated driveshaft geometry on shackle reversal setups. Because we have no control over how the parts are handled or installed, we are not liable for any problems or failures of this product unless it is a defect of design, materials or workmanship. Determination of this warranty is at the fair discretion of Novak, Inc.

Should you have any questions concerning this conversion or these components, we welcome you to contact us.