

Introduction

This guide will assist the installer in adapting the NP435 transmission to the Jeep Dana Models 18 & 20 transfer cases as found in 1941-1979 Jeeps.

Note to the Installer

This document and the use of any Novak products assumes safe and adequate working knowledge of the automotive systems involved. Vehicular repair, upgrade and conversion work can be among the most difficult of automotive mechanical and electrical tasks and it is upon the customer to ascertain whether they are working within their expertise or whether they should acquire assistance. Because Novak has no control over the customer's project procedures, Novak instructions and recommendations do not constitute a warranty of fitness, applicability or compatibility with the customer's particular project. Novak cannot determine the skill level of the customer and/or the installer of Novak products, nor can Novak publish all of the information on fundamentals that an installer should know before attempting these advanced procedures. While every attempt at informational accuracy has been made, these instructions and any recommendations therein are for guidance only. This guide is not intended to replace the service manual specific to your vehicle. It is not possible to document the wiring, routing and specific system details of every vehicle and the installer should obtain and use both their vehicle's manual and the engine or transmission donor vehicle's manual in conjunction with these instructions.



Your Legal Requirements

Novak products and procedures are intended and recommended for off-road use only and installation on a vehicle for use on public roads could violate laws within your jurisdiction. Additionally, installation of Novak products may adversely affect the warranty coverage on your vehicle.



This guide is not meant to explain, interpret nor notify the installer any laws concerning vehicle changes, engine conversions and the emissions systems surrounding them. It is the installer's responsibility to know and understand their local, state and national legal requirements and regulations and to make their installation conform to emission and vehicle safety demands of the jurisdictions in which the vehicle may operate. Novak does not recommend nor condone the disabling or modification of the vehicle or any system within it that could render it out of conformance with any laws in which the vehicle may be licensed or operate. Neither Novak Conversions nor its directors, principles nor employees are responsible for any changes made to your vehicle.

If you are performing a powertrain conversion and if your vehicle requires a referee inspection, you may wish to establish a rapport with them and discuss your plans and seek advice and approval from them prior to commencing your modifications.

These instructions and the products and procedure described herein are offered only in accordance with the Novak policies and liability limitations found at: <http://www.novak-adapt.com/about/policies.htm>, which may supersede and prevail over these policies.

About the NP435 Transmission

The 435 is an excellent, heavy-duty truck transmission designed and used in 1/2, 3/4 and 1+ ton trucks. It is a well-built transmission and remains easy to locate and generally inexpensive to buy and maintain. The strength, relatively short size and the gearing of the transmission make it a good choice for a variety of situations.

The NP435 was made by New Process Gear from 1962 thru 1997. They are found primarily in Ford trucks from 1966 to 1992 and Dodge trucks from 1962 to 1993. They also had limited distribution in GM & Chevrolet trucks from 1968-1972. They are also found in some International Harvester and industrial applications.

Identification

This transmission is 10.8" long and features an aluminum top cover that is retained by eight bolts. The NP435 case is of cast iron.

The Ford NP435 has a 1-1/16" diameter, ten spline input shaft that has a stick-out of 6-1/2" from the front face of the transmission. The pilot tip of the transmission measures ~17mm. The front bearing retainer flange measures 4.85" and the bearing retainer tube is 1.43" in diameter. The front bolt pattern is the symmetrical Ford "butterfly" pattern; roughly 8-1/2" wide by 6-5/16" tall.

The Dodge NP435 has a 23 spline input shaft with an 8-3/8" stick-out. The Dodge NP435 featured two different styles of front input shaft & bearing retainer. The earlier and less common style (from 1962- generally) used a deep ball roller bearing input. These earlier units are not compatible with our conversion assemblies. While ball bearing front versions still persisted in some applications, they were rarer after 1969. The more common and later style featured a tapered roller bearing and cup assembly. These later versions are compatible with all of our adapter assemblies.

The GM / Chevrolet NP435 has a 10 spline input shaft with a 6-1/2". This version was only available with the roller style input bearing instead of the later and more common tapered bearing design. None of the GM NP435's are compatible with our adapter assemblies.

The shifting pattern for all of the 435's is in the standard "H" pattern with reverse gear being to the right side, and down.

Features

The NP435 is a top loaded, top shifting truck style transmission. The NP435 enjoys a very low compound gear at 6.68:1 and as such it is a popular choice for those wanting a very low crawling gear. Note that some Dodge versions of this transmission offered a taller first gear of 4.56-to-1.

The NP435 features a power-take-off (PTO) port on the passenger side of the case.

About This Conversion

Our NP435 to Dana 18 & Dana 20 conversion creates a robust geartrain assembly for broad use in severe terrain or tame roads. It is one of the most steadily popular manual shift transmission conversions into Jeeps, providing a very compact geartrain, an extremely low crawling gear, compatibility with several engines and straightforward installation.

NP435 Specs at a Glance:

Make: New Process Gear

Length: 10.7"

Height: 19.25"

Weight: 135 lbs.

Case: Cast iron

Top Cover: Die-cast aluminum

Gear Ratios:

(435A / 435D / 435E / 435L)

4.56, 2.28, 1.31, 1.00, R5.64

4.90, 2.29, 1.19, 1.00, R6.06

6.68, 3.34, 1.74, 1.00, R8.26

6.68, 3.34, 1.66, 1.00, R8.26

PTO Port: Passenger side



**Ford NP435
four-wheel-drive
rear face bolt
pattern**



**Ford NP435
two-wheel-drive
rear face bolt
pattern**

The Adapter

The Novak NP435 to Jeep transfer cases adapter is 3.5" long for a combined transmission and adapter length of 14.2". The adapter itself is cast and machined of a high-grade aluminum alloy, featuring thick flanges and a heavy cross-section.

NP435 Versions

All Ford versions and most Dodge versions of the NP435 can be adapted to these transfer cases. GM NP435's and Dodge NP435's (early) are not compatible due to their input shaft ball bearing and snap ring mainshaft design.

As to type of NP435, there are no inherent advantages to the 2wd vs. 4wd transmission.

Note that divorced 4wd applications of the NP435 often (but not always) used a 2wd style tailhousing and yoke. More details concerning this are available on our NP435 Knowledge Base article on the Novak website.

Transfer Case Versions

All Jeep models of the Dana Spicer 18 and Dana Spicer 20 transfer cases are compatible with this adapter assembly.

IH versions of these transfer cases are also compatible.

Transfer Case Input Gears

The included adapter shaft is splined for either six-spline input gears, or ten-spline input gears.



Engine Compatibility and Adaptability

Dodge & Ford

As the reader will conclude, the Dodge NP435 will marry directly to a Dodge style bellhousing. Likewise for the Ford NP435 and its bellhousing compatibilities.

AMC Jeep

The Ford NP435 is also an excellent candidate for AMC Jeep bellhousings made from 1976 to 1986 that were married to the T150, T18 and T176 transmissions, or otherwise have an available bellhousing bolt pattern of 8-1/2" wide by 6-5/16" tall. They are readily compatible with these engines and bellhousings, and need only a custom pilot bushing. For more details, see Adapting Ford Transmissions to AMC Bellhousings on the Novak website Knowledge Base for details.

GM

Many of the Ford NP435's have two extra undrilled ears cast into the front face of the transmission case. This is important if you intend to run it behind a GM bellhousing. The transmission having these extra undrilled ears will greatly simplify its use with GM engines. For more details, see Adapting Ford Transmissions to GM Bellhousings on the Novak website Knowledge Base for details.

Six-spline gears are predominately most common, as found with the Jeep T84, T90, T86, T89, T98, T18, T15 & T150. The rare ten-spline version is only available on the 1966 - 1974 transfer cases against the Jeep T14 transmission.

Dana 18 or 20 input gear with 6 splines. All Warn type overdrives are compatible with this conversion. Spline count information is the same.

Factory Jeep TH400 to Dana 20 combinations had a fifteen-spline input gear, which must be replaced by a compatible six-spline version.

International Harvester Dana 20's that had the TF-727 automatic had a 23-spline input gear, which must be replaced by a compatible six-spline version.

Consult our informative Dana gears interchange chart on the Novak website Knowledge Base if needed.





Engine Crank to Transmission Pilot Bushing

These transmissions will be married to stock as well as conversion engines, and a custom pilot bushing will be required in many instances.

Assembly Procedure

Where you are replacing a factory mainshaft with a new conversion shaft, these instructions are to be used in conjunction with the *Novak Guide to Rebuilding the NP435 Transmission*, sent with your Novak adapter kit. While you may or may not be doing a full rebuild of your transmission, follow the relevant sections of that guide based on the depth of your transmission build.

Transfer Case Fasteners Removal

If you've not already done so, remove any bolts and studs that remain in the Dana transfer case. This may be done with double nuts and wrenches, or with locking pliers.

Clean All Mating Surfaces, Splines & Threads

Clean all adapter mating surfaces on the rear face of the transmission as well as the transfer case input, being careful not to contaminate either of their internals with any particles. It may be necessary to razor off old gasket material and sealants. The mounting face of the transfer case may have accumulated a considerable amount of rust and dirt. File or sand flat if required. Follow up with a solvent, rag and compressed air as needed.

Clean and flush the transfer case input gear spline bore using solvent and compressed air. You may use a small wire brush to clean the splines and any rust on them.

Clean and inspect all transmission and transfer case face threads. It may be necessary to run a threading tap for clean-up. In the event of severely damaged threads, thread repair inserts might be required.

Adapter Test Fitment

Trial fit the adapter to the rear of the 435 transmission case, leaving the provided gasket off to make certain the adapter mates up easily and squarely. Make sure they fit firmly together by hand and with minimal resistance. At this test fitting stage or final assembly, never use the adapter bolts and force to bring the assembly together as this can fracture any adapter flange and void the warranty.

Then, test fit the adapter against the front face of the Dana transfer case. It should locate squarely onto the centering input bearing retainer and slide flatly against the transfer case input face. If it does not, check for any nicks or burrs and rectify as appropriate with a flat file or other means.



Spline Shaft Test Fitment

Before the assembling of either your transmission or transfer case, test fit the transmission output shaft into the Dana input gear to test for proper spline count and fit. Make sure they slide nicely together and by hand. The splines should slide together and have essentially no lash.

If you are working with a Warn or other aftermarket overdrive assembly, test fit the overdrive planetary hub in like fashion as above. Note that some of these overdrives have featured

broached splines with radiused or chamfered corners. Check fitment here carefully and contact Novak if there is any interference and we'll assist anywhere we can.

Transmission Preparation

The new output shaft supplied with your kit will need to be installed in the transmission before final assembly. This is usually best done by an automatic transmission professional, though several of our customers have the tools, skills, and documentation to do a successful shaft change-out. Whatever your method, this is usually a good time to check the clutches, bands, seals gaskets and filter and replace and rebuild if necessary.

Adapter to Transmission Installation

Your adapter has been pre-assembled at our facility with its internal oil seal and we've included a new NP435 rear gasket and Dana transfer case face gasket.

Thread the provided 1/2" fasteners to through the adapter into the transmission case. We recommend the use of Permatex® Loctite Blue 243 thread locking compound. Fit the adapter to the transmission flange and install the lock washers, then nuts, tightening them in a crossing pattern in three successive stages until you've achieved 38 ft. lbs. of torque.

Transfer Case Input Gear Installation

The sequence differs between Dana 18, 3-5/32" bore versions and the Dana 18 & 20, 4" bore versions. The former must be installed through the PTO port after adapter assembly. This is also true for overdrive barrel gear assemblies. The 4" versions can have the gear installed onto the assembly and installed through the transfer case input bore.

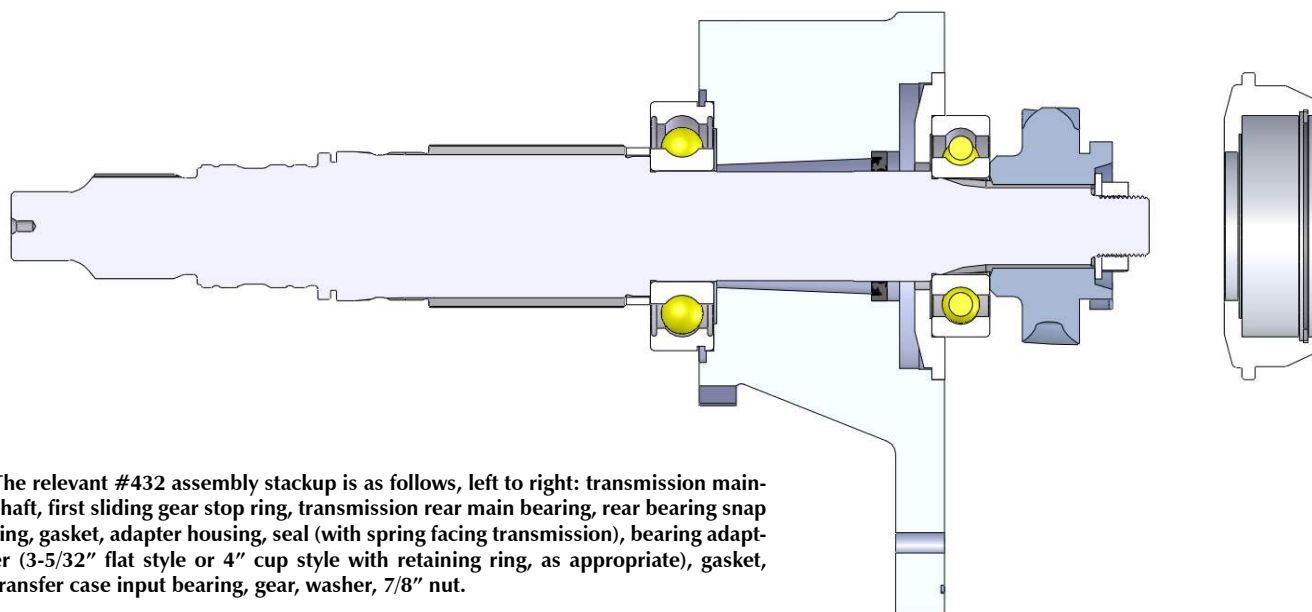
Install the provided washer on behind the gear, followed by the 7/8-16 nut. Final torque on this nut is 120 ft. lbs.

Overdrive Installation, if applicable

If installing an overdrive with its special nut, less torque than the 120 ft. lbs. is required as it is safetied to the assembly by its associated retaining ring. Follow by installing your overdrive assembly as per factory.



Two of our preferred gasket sealants include Permatex® The Right Stuff RTV silicone and Permatex® Aviation Form-A-Gasket in the brush-top bottle. Years of experience building many hundreds of gearboxes, leak-down testing them and hard operation prove them to be superior.



The relevant #432 assembly stackup is as follows, left to right: transmission main-shaft, first sliding gear stop ring, transmission rear main bearing, rear bearing snap ring, gasket, adapter housing, seal (with spring facing transmission), bearing adapter (3-5/32" flat style or 4" cup style with retaining ring, as appropriate), gasket, transfer case input bearing, gear, washer, 7/8" nut.

Transfer Case to Adapter Installation

A gasket that corresponds to the "Texas" Dana transfer case face has been provided. We recommend a gasket sealant as discussed above on both faces of this gasket. Tack it to the transfer case face.

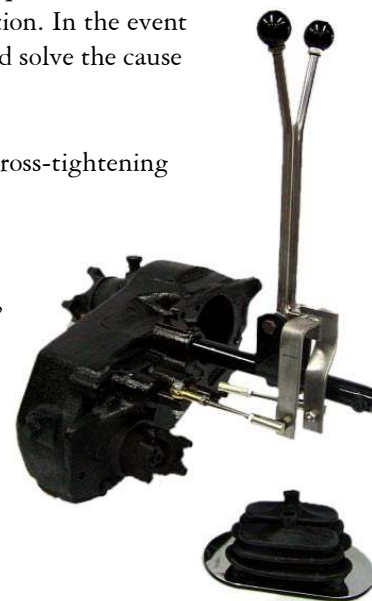
Fit the transfer case to the back of the adapter, locating it on the bearing or bearing adapter of the #432 adapter and close the gap. Thread the five bolts and their lock washers as per convention. In the event of a bind, do not use the bolts to pull up the transfer case. Remove the transfer case and solve the cause of the binding and retry.

Tighten the bolts evenly and lightly and then follow up with an even and sequential cross-tightening of the six bolts to a final torque of ~38 ft. lbs.

Transmission Shifter

Factory NP435 shifters usually work fine in Jeeps. Note that Novak carries new, straight shifter sticks that can be bent to your preference and will often restore a sloppy feeling shifter.

The Jeep floorboard piece can be modified to clear the transmission top cover. The top cover should be on the transmission when installed. This will prevent having to make a large cut in the driver's side of the body. The driver's side of the body will only require a notch approximately 1/4 inch wide and 3-1/2 inches long to make sure the side of the shift tower does not touch the body.



A Hurst® (part #114-7494) or Spark-O-Matic® or other large boots work well for this application.

Driveshafts

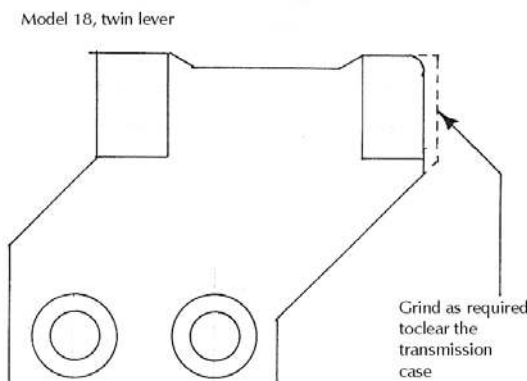
The NP435 features great driveshaft side clearance. Factory driveshaft diameters are recommended, but a larger diameter shaft could be used, though there is no real benefit to having a larger, thin-wall driveshaft vs. a smaller, thick-wall factory style shaft.

Driveshaft length changes are often required, as this geartrain combination is typically longer than factory Jeep combinations. However, some GM engine installations will allow for the transfer case to remain in its OEM location.

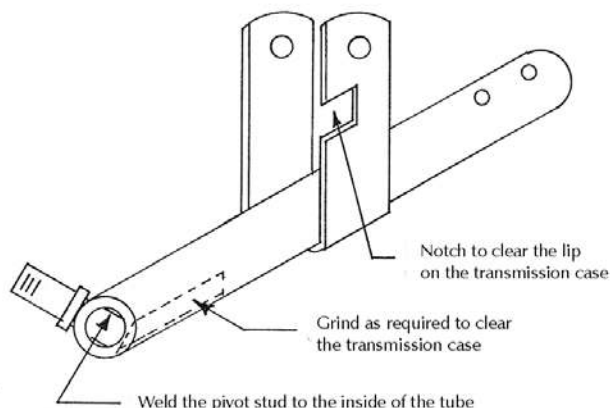
Some of our customers, fearful at the perceived expense of new or modified driveshafts, attempt to let the existing driveshafts dictate engine, transmission and transfer case location, sometimes to the detriment of the project. Driveshaft modifications are usually inexpensive when performed by driveline, 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.

Model 18 Twin Stick:

Grind the inner shift pivot ear as required for clearance to the transmission case. See diagram, adjacent.



Model 20 in 1972 to 1979 CJ's

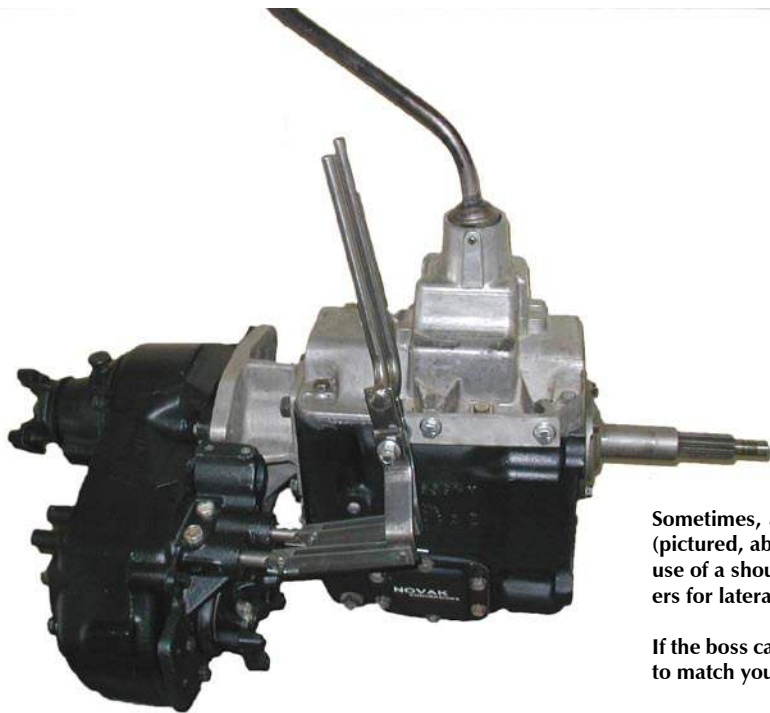
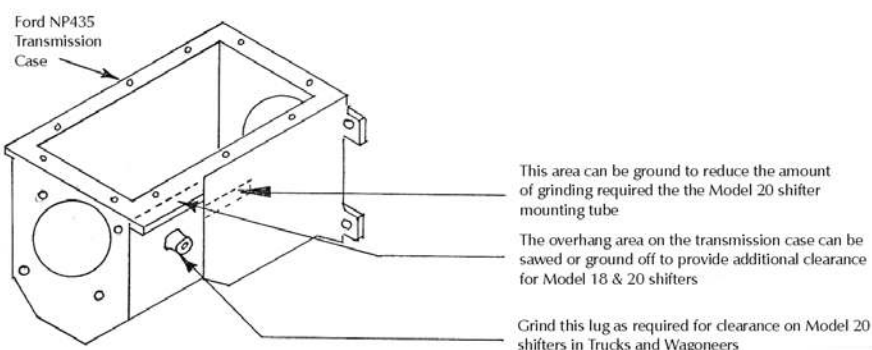


Model 20 in 1972 to 1979 CJ's:

Weld the bellcrank pivot to the inside of the mounting tube. Grind the original weld as well as the transmission side of the mounting tube. Some grinding can be done on the transmission case to reduce the amount ground from the tube but be careful not to grind through the case. Also notch the shifter mounting "horseshoe" to clear transmission case or saw off the overhanging edge of the case for clearance. Refer to the diagram at the left.

Model 20 in 1966 to 1979 Trucks & Wagoneers:

These must be the short style mounting tube that engages the shift shafts directly (without extension links). These will clear without modification unless the NP 435 being used has a lug cast on the side. If so, the lug must be ground to clear the shifter casting.

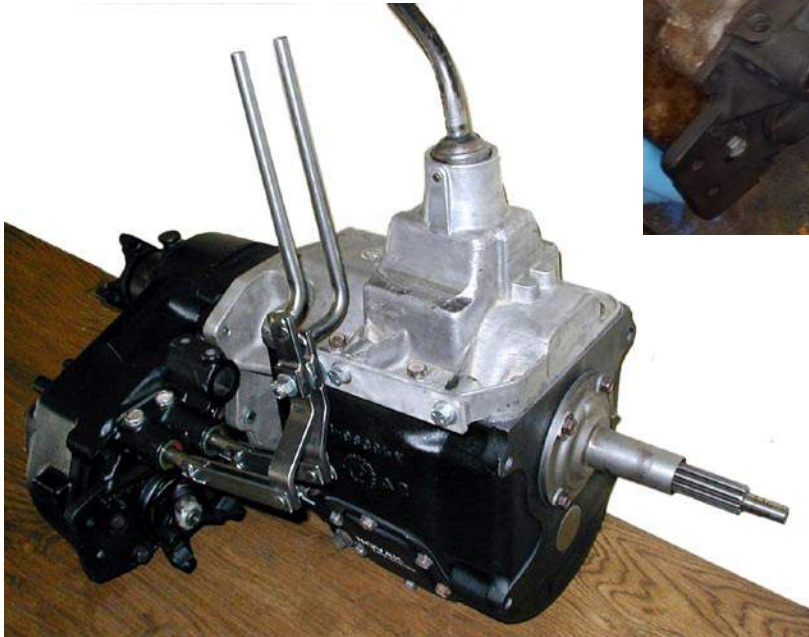


Sometimes, an installer is lucky enough to be able to use an existing boss (pictured, above) on the NP435 shifter as a transfer case shifter pivot point. use of a shoulder bolt is ideal , especially when used with springs and washers for lateral position of the shifter stick(s) and setting a good preload.

If the boss can't be directly used, a transfer plate (pictured, left) can be made to match your Jeep and the above strategy used as deemed best.

Transfer Case Shifters

This transmission conversion will allow for the retention of the factory Dana 18 twin-stick shifters, Dana 18 single-stick shifter, and many of the Dana 20 shifters. Occasionally, some shifter castings re-



quire minor grinding. Some tube-mounted Dana 20 shifters may need to be modified, or possibly replaced with an aftermarket twin-stick shifter kit, example right. See a few more ideas, below.

without modification. It will be necessary, however, to make a shifter mounting bracket. A short section of angle iron attached to 2 or 3 of the transmission top cover bolts on the passenger side and can often be made to work. A shoulder bolt of the same diameter as the shifter bushing often works well for a pivot. Springs and spacers can be used to set the side load on the shift lever to clear up play in the diameter.

Models 18 & 20 with Remote Mounted Shifters:
These transfer cases had no provision to mount a shifter so they will clear the 435 transmission

Transmission Rear Mount

This transfer case adapter's design features a mounting and support system. Novak adapters are not just adaptation components, but strong structural components of the vehicle's powertrain. As such, they are often the best place to support the important rear mount unit.

Some factory transmission mounts featured a torque-arm isolator with an offset, ostensibly to cut down on the kick-back from drivetrain twist. This stronger, centered style rear mount is typically just as effective when used in conjunction with good engine mounts, which have the largest effect on capturing rotation. If your exhaust used a hanger off this point, you or your exhaust professional will need to fabricate a suitable hanger, which can be anchored to this rear mount assembly if needed.

On 1976 to 1979 CJ5 and CJ7, the rear cross member is also the skid plate.

On these vehicles the skid plate should be mounted in the rear set of bolt holes in the frame. An additional spacer may be required between the skid plate and the cushion to get transfer case clearance at the skid plate.



The bottom of the Novak adapter is drilled for a common Chevy & Jeep rear mount found on standard, as well as automatic transmissions. It is sold in many part stores as Borg Warner #31-2268. It is our part #RMU (urethane). This cushion will mount on all Jeep rear cross members but it will be necessary to relocate the cross member on many installations.

Vertical spacing using spacers or washers may be required to achieve the ~ 4 deg. of downward powertrain tilt recommended.

A Warning on Hard Mounting

Under no circumstance should you “hard-mount” any part of your powertrain and doing so will void any warranty offered on this kit. Hard-mounting involves mounting the engine or transmission solidly to the frame horns, or to the crossmember / skidplate. This rigidity may be permissible in a race car that only sees smooth track, but is in no way appropriate for a regular street vehicle, let alone a 4wd vehicle. The powertrain requires the give, flex and shock-absorption afforded it by urethane, rubber or similar isolators.

As concerns the rear mount: even if you install a crossmember that is itself mounted to the frame on flexible isolators (also not a good idea as the crossmember is intended to be a structural and solid component of the frame), this is not enough since the amount of moment force required to flex that kind of crossmember is significantly higher and will unnecessarily strain the transmission case, rear mount base and the adapter. This can cause cracked cases, chronically loosening bolts, excessive driveline shock, broken parts, etc.



This Jeep featured a hard-mounted adapter, though with isolators at each end of the transmission support crossmember, which offers inferior powertrain flex and unacceptable frame flex. To counteract the latter, the installer welded a tubular crossmember behind the transfer case, which makes future servicing highly problematic.

Best stick with a more conventional skidpan and rear mount isolator, which offers better characteristics, geartrain shielding and frame strength.



Engines & Engine Mounting

An NP435 installation is sometimes done in conjunction with an engine conversion into the Jeep. These engines include the Chevrolet Small Block V6 & V8, from Generations I, II, & III, 1955-2012+, Ford, Dodge and AMC engines.

Novak's MM Series engine mounts, featuring excellent vibration dampening, superior strength and impressive adjustability - adjustable even after the engine is installed. The design and strength and affordability of our mounts are second to none.

In any scenario, it is critical 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 NP435 and Dana transfer case both considered.

Axles

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

Speedometer

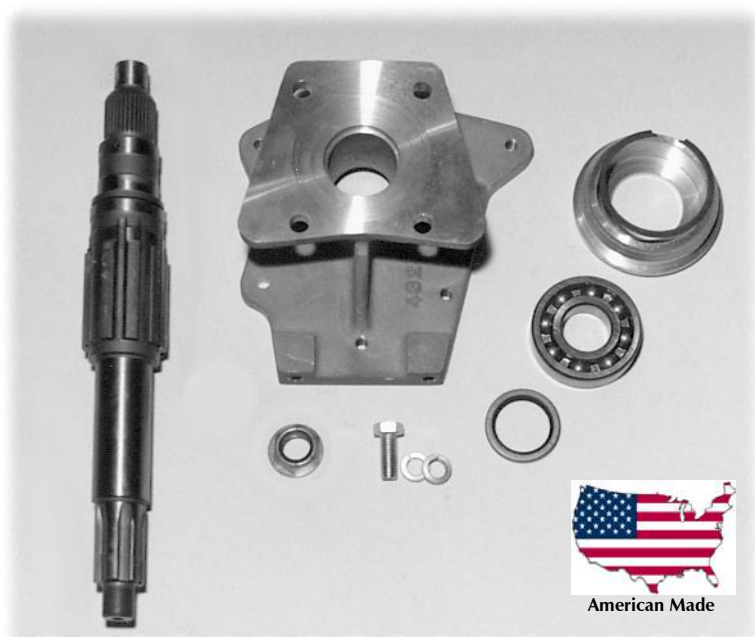
Because you're retaining the factory Jeep transfer case, you'll use its speedometer output to the factory (or aftermarket)

gauges just as original. If you are running a cable driven gauge and a computer controlled engine that requires a VSS, you may need to run a signal generator with both cable and electrical outputs and as appropriate for your particular engine's PCM.

Conclusion

We suggest that you keep these instructions for future reference. For questions concerning your conversion, contact us. We'll be pleased to answer your questions.

There is no final word to our instruction packages. If you have a question you feel this information should have covered and didn't, please let us know about it. You are also welcome to submit your suggestions, ideas and images that you think we should include here which may help future conversion installers. Note our contact information below.



About Your Novak Adapter

The Novak #432 adapter kit is built to high standards of design, materials and build. The adapter housing is cast of 356-T6 aluminum and is gusseted for remarkable strength. Our shaft is machined of a high-grade alloy steel and specially hardened for strength and longevity. Your adapter kit has been shipped assembled with the seal.

Novak warranties 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 warrantied 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 discretion of Novak, Inc.

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

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877.602.1500

Kit #432-3 items marked with a (*) are replaced by kit #432-4 items marked with a (**).

Part No.	Description	Qty.
CST-432	Adapter, casting, 432, NP435 transmission to Jeep 18 & 20 transfer cases	1
MS-432	Shaft, main, NP435 transmission to Dana 18 & 20 transfer cases. S35-10-6 spline (or 10 spline)	1
644551	Bearing, deep groove ball, single row, T90 rear output	1
1213N	Seal, oil, Novak 432 & 462R transfer case adapters	1
* 8187	Gasket, front face, Dana 18, 3-5/32" bore, 1941-1971, T90 transmission	1
* 644552	Retainer, rear output bearing, T90 transmission, 3-5/32"	1
940970	Nut, 7/8-16, Nylock, Jeep / Dana mainshafts	1
A1410	Washer, flat, 7/8", Dana 18/20 interfacing mainshafts	1
BT-HEX-12-13x1.250-G5Z	Bolt, 1/2-13 x 1-1/4, hex head, grade 5, zinc plated	1
BT-HEX-12-13x1.500-G5Z	Bolt, 1/2-13 x 1-1/2, hex head, grade 5, zinc plated	3
WA-SL-12-Z	Washer, lock, split, 1/2, zinc plated	4
BT-HEX-38-16x1.250-G5Z	Bolt, 3/8-16 x 1-1/4, hex head, grade 5, zinc plated	5
WA-SL-38	Washer, lock, split, 3/8, zinc plated	5
** 8179	Gasket, front face, Dana 18 & 20 transfer cases with 4 in. bore	1
** 315-80RR	Ring, snap, retaining, Dana 18 & 20 transfer cases, 4" retainer	1
** 928477	Retainer, rear output bearing, T86 transmission, 4" bore,	1