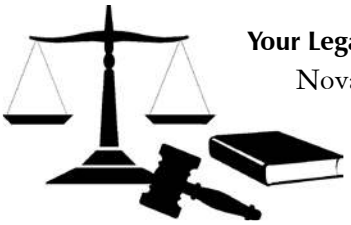
Introduction

This guide covers adaptation of newer Jeep four- and five-speed transmissions 1941-1979 Jeeps with Dana Models 18 & 20 transfer cases. This kit is only intended for Jeeps that have the length necessary to accommodate these longer transmissions, which include the AX15, NV3550, NSG370, T176, T4, T5, TF999 and AW4.

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.

Transmission Possibilities

The Novak #152 adapter is 2" long. While this is very compact for a twin-bearing adapter, the mating transmissions may prove long for some early Jeeps. For your reference, some combined lengths include:

AX15, 16-1/2" (+ 7-1/2" bellhousing*)
NV3550, 16-1/2" (+ 7-1/2" bellhousing*)
NSG370, 24" (integrated bellhousing*)
T176, 16-1/2" (+6-3/4" bellhousing*)
T5, 17-1/2" (+6-3/4" bellhousing*)
TF999, 24-3/4"
AW4, 27-3/8"

Most of these lengths will not be appropriate for early CJs (pre-1972) with short wheelbases, unless the engine is a V6 and has been installed in as far forward a manner as possible.

The adapter is machined from corrosion resistant 6061 aluminum. The included adapter shaft is available as a 23 spline input and 6 spline output only.

*AMC / Jeep bellhousings. May vary slightly when adapted to GM or other bellhousings.

Transfer Case Clocking & Rotation Options

Our adapter is drilled for multiple clocking locations from near-factory (20 degrees down) to near-flat (3 degrees down). However, pan clearances and front axle width may inhibit the flatter options.

Contents

The 152 kit includes adapter housing, adapter shaft, bearings, seals, correct locator for your transfer case model bore, hardware, and instructions. These parts will come assembled to the extent possible.

About This Conversion

Our #152 conversion can create a versatile geartrain assembly for broad use in rougher 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.

The Adapter

The adapter is machined from corrosion resistant 6061 aluminum. The included adapter shaft is available as a 23 spline input and 6 spline output only. The adapter assembly features twin deep-ball roller bearings, oil seal and the appropriate rear bearing locator adapter for 3-5/32" or 4" bore transfer case applications.
n 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.

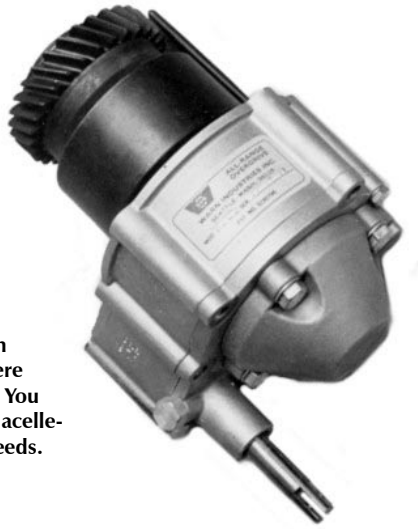
Transfer Case Input Gears

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

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.

All Warn type overdrives are compatible with this conversion. Spline count information is the same.

While it is mechanically possible to run overdrive transmissions against a Dana 18 that features a Warn style overdrive, consider that you would have an overall overdrive ratio of ~.5 (~.70 in the transmission and .75 at the transfer case overdrive). Transfer case output speed would be nearly double that of the engine speed. While this is a fascinating idea and would excellent for mileage if the engine can sustain the low RPM cruise, the velocities that it could turn within your Dana 18 may be overwhelming if not damaging. Keep in mind that the D18 and its overdrive were not designed for that type of RPM use. You would likely run into noise, oiling and acellerated wear issues at those sustained speeds.



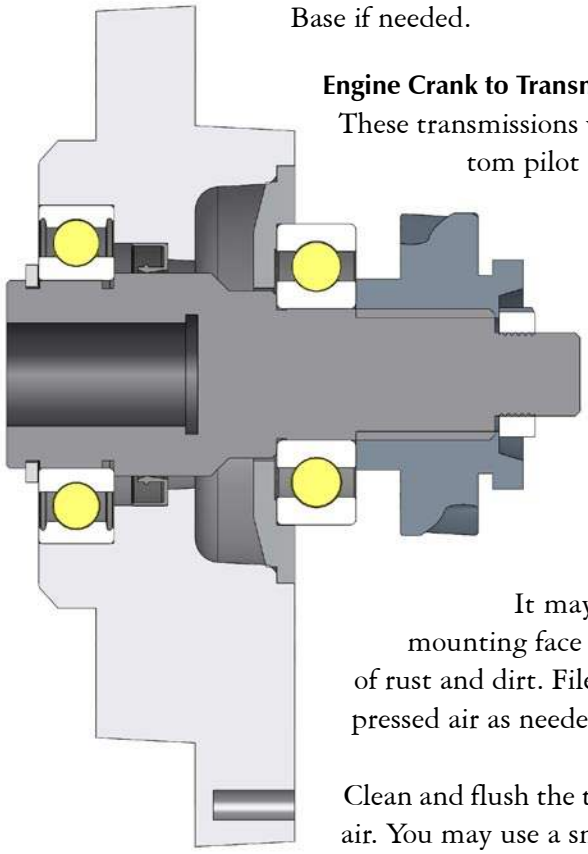
Factory Jeep TH400 to Dana 20 combinations had a fifteen-spline input gear, which must be replaced by a compatible six-spline version.

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.



The relevant #152 assembly stackup is as follows, left to right: adapter shaft, adapter beaering, adapter housing, seal (with spring facing transmission), bearing adapter (3-5/32" flat style (shown) or 4" cup style with retaining ring, as appropriate, gasket, transfer case input bearing, input gear, washer, 7/8" nut.

Assembly Procedure

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 my 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 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.

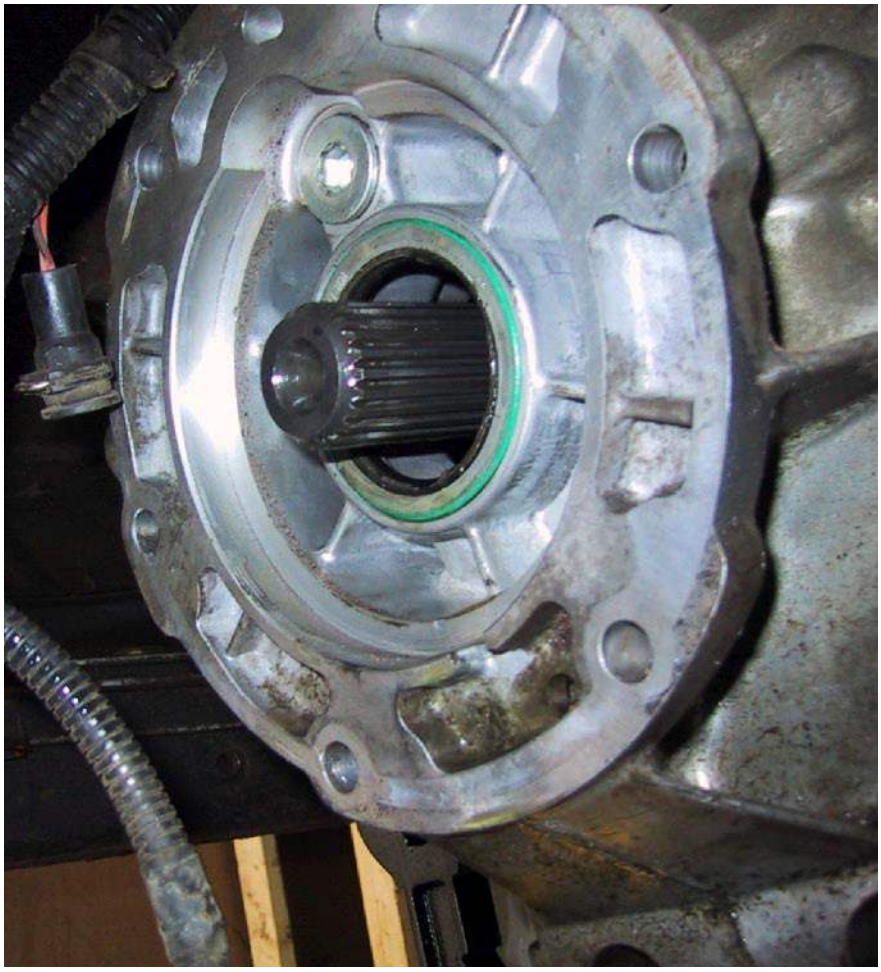
Then, test fit the adapter against the front face of the Dana transfer case. It should locate squarely onto the centering input bearing retainer and slide flatly against the transfer case input face. If it does not, check for any nicks or burrs and rectify as appropriate with a flat file or other means.

You may choose this as a time to determine your clocking angle of the transfer case, taking into account the variables such as driveshaft clearances, shifters, ground clearance, body tunnel clearance, etc.

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.



Remove the factory rear output seal to permit the free flow of transmission lubricant to the adapter front bearing. Your factory adapter / tailhousing may have a weep hole which must be plugged, typically using RTV silicone.

Transmission Preparation:
Transmission Output Seal Removal

The output seal to your transmission must be removed prior to adapter installation. Starvation of the adapter's front bearing may occur if this step is omitted.

Weep Hole Sealing

If your factory adapter features a weep hole, clean the area with solvent and a wire brush and use RTV silicone to plug the hole.

Adapter to Transmission Installation

Your adapter has been pre-assembled

at our facility with its internal oil seal and we've included a new transmission gasket and Dana transfer case face gasket.

Once you've determined your transfer case clocking angle using the various threaded hole choices, thread the provided 3/8" stud 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.

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.

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. If installing an overdrive with its special nut, less torque is required as it is safetied to the assembly by its associated retaining ring.

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.

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 #152 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

Because this conversion covers multiple transmissions, shifters information and modification varies. The Jeep floorboard piece can be modified to clear the transmission top cover.

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

Driveshafts

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.

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.

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

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

Transmission Rear Mount

Use your factory transmission rear mount to support the rear of the powertrain. It will need to be adapted to the Jeep crossmember / skid pan as appropriate.

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.

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

Transmission conversions are 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 transmission 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 after-market) 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.

American Made

Kit #152-3 items marked with a (*) are replaced by kit #152-4 items marked with a (**).

Part No.	Description	Qty.
BIL-152	Adapter, billet, 152, adapting the Jeep New Process & Dana 300 flanged transmissions to the Dana 18 & 20 transfer cases	1
AS-124	Shaft, adapter, 124. 23 spline transmissions to Dana 18 & 20 transfer cases	1
644551	Bearing, deep groove ball, single row, T90 rear output	1
6210	Bearing, deep groove ball, single row, 6210 1 0	
6879H	Seal, oil, rear output, Novak 124 & 152 adapters, and Dodge 35 spline 2wd NP435	1
5160-193	Ring, snap, retaining, heavy duty, external for 1.938 in. shaft x .125 in. thick	
* 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
92865A626	Bolt, 3/8-16 x 1-1/4, hex head, grade 5, zinc plated	4
91251A630	Bolt, 3/8-16 x 1-3/4, hex socket, standard head	1
95462A031	Nut, 3/8-16, hex, grade 5, zinc plated	6
90281A632	Stud, 3/8-16 x 2 in. x 0.750 in. partially threaded equal length ends, black oxide	6
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