

Introduction

We hope that the installation of your new Novak adapter assembly goes smoothly and that you achieve the improved results with your Jeep® that you intend. This kit is for adapting the GM HydraMatic 4L60-E transmission to the Jeep® Dana Models 18 & 20 transfer cases, as found in 1941-1979 Jeeps.

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.



Despite whatever your experience with this type of work may be, we strongly advise you to read these instructions well and save them for future reference and parts numbers. Contained in these instructions are the requirements, tips, hints and tricks of years of performing these conversions, both in our own facility and information we've gained from discussing this swap with our customers. Put this information to good use.

Product Summary

Our 4L60-E (including the 4L65 & 4L70) to the Jeep New Process (or New Venture) transfer cases conversion makes for the most refined assembly both on-road and off-road, and has become a more common conversion in recent years.

This kit is only intended for longer wheelbase Jeeps, and other specialty conversions, such as Land Rovers, Land Cruisers and other vehicles in which Jeep transfer cases would be useful.

The Adapters

The Novak 4L60-E to Jeep NP / NVG transfer cases adapter is 6.5" long for a combined transmission and adapter length of 27.5" (equivalent to a 20.5 " manual transmission).

The adapter is of billet and cast and machined of a high-grade aluminum alloy, featuring thick flanges, a heavy cross-section and strength-adding gussets.

Engine Compatibility and Adaptability

The front face 4L60-E is natively compatible with either the Chevrolet 90 degree "Small Block" & "Big Block" patterned engines (image, right), including the V6, V8 & I6.

Conversion Procedure

If not already done. Remove the six bolts and the original Hydramatic tailhousing or adapter (in the event that they came with the transmission).

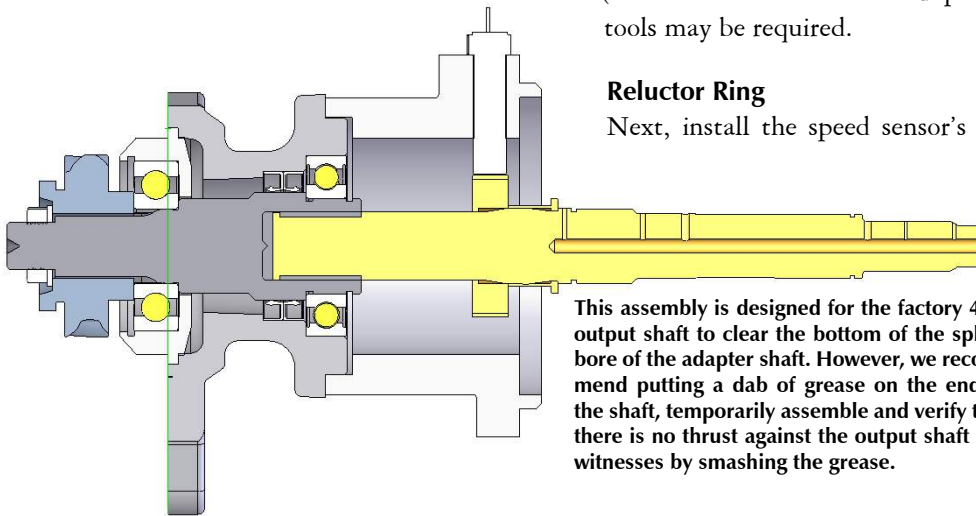
Transmission Output Shaft

You will use the GM, factory 4wd style output shaft with this conversion. If you have a 2wd style transmission, you need to install the 4wd shaft and our adapter assembly to make it fully compatible with your conversion.

Individuals interested in working on the 4L60-E internally, should do so with the assistance of a factory



level service manual, or consider using Technical Video's DVD #12-4L60E (www.technicalvideos.com or phone 1.715.552.8016). A few specialty tools may be required.



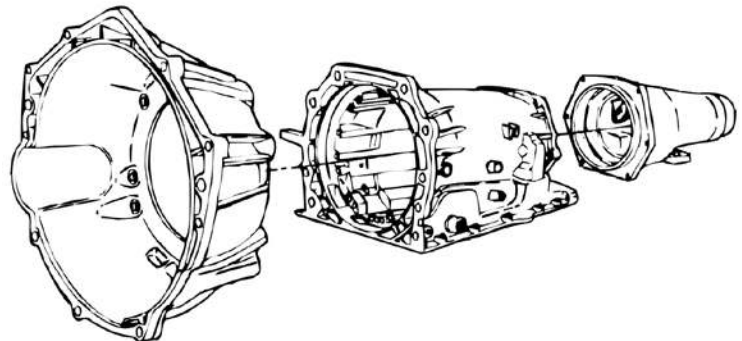
Reluctor Ring

Next, install the speed sensor's steel reluctor ring (provided) onto the transmission output shaft with the lock collar forward on the output shaft's blank journal. Tighten the socket head bolt in the collar with an Allen style wrench to secure the ring. Note that there are no significant operating mechanical forces against the ring except the windage of the transmission fluid and this collar retention system is very adequate to that task.

This assembly is designed for the factory 4wd output shaft to clear the bottom of the spline bore of the adapter shaft. However, we recommend putting a dab of grease on the end of the shaft, temporarily assemble and verify that there is no thrust against the output shaft if it witnesses by smashing the grease.

Extension Housing Installation

Test fit the billet adapter to the transmission flange. The adapter locator step should slip-fit into flange bore, with only minimal side-play. Remove the adapter and install the square-section o-ring onto the adapter's locator step. You may use RTV at this time, however, the o-ring will seal sufficiently and eliminate the risk of a piece of RTV getting into the transmission with critical consequences. Bolt the adapter to the transmission using the six 10 x 1.5mm studs supplied with the kit into the back of the transmission case so they protrude about 1". Use a drop of thread locking compound, such as Loctite™ Blue on the transmission flange threads. Install the adapter. Follow with the six supplied lock-washers and nuts. Tighten to 30 ft/lbs. It is a good idea to cross-tighten the nuts to torque in three sequential stages.



Speed Sensor

The VSS pickup supplied is intended to be threaded into the threaded port on the adapter. Use thread sealant or Teflon tape, making sure no excess tape or debris gets into the transmission assembly.

With the extension housing installed, thread the provided speed sensor into the threaded port at 12 o'clock. Sighting through the back of the adapter, thread the sensor until it just touches the perimeter of the reluctor ring. Then, turn the sensor back about 1/2 of a turn, or use a feeler gauge to achieve ~.025" to .030" of gap between the sensor tip and ring teeth.

You may wish to use a very tiny amount of thread locking compound on the last couple of threads or use the provided jam nut to prevent any rotation of the sensor.

Adapter Installation

We have pre assembled the adapter assembly, including its seals, bearings and shaft. Make sure its o-ring is in place on its front locator step. You will now fit this assembly to the back of the extension housing you've installed and fasten it with the provided 3/8" x 1-1/4" bolts and split lock washers. Tighten to 30 ft/lbs.

Transfer Case Input Gear

If you're working with a Dana 20 or Large Bore Dana 18, you can install your input gear onto the adapter shaft now. If you are working with a Small Bore Dana 18, you can follow this procedure after the adapter is installed, working through the PTO

Vehicle Speed Sensors and Speedometers

The included VSS assembly will supply your ECM (or aftermarket standalon computer) the proper information to run the transmission. The ECM can then run newer GM and aftermarket speed indicator gauges. However, you may wish to keep things simple by retaining the mechanical speedometer function of the Dana output assembly. This will facilitate keeping your existing Jeep mechanical gauges.

port of the transfer case.

Slip the input gear onto the adapter spline shaft, shouldering it against the adapter's bearing inner race. Install the provided 7/8" washer and Nylock nut. It may be necessary to restrain the gear with a canvas strap. Torque the nut to 120 ft/lbs.

Transfer Case Installation

Prepare the transfer case for assembly to the adapter by cleaning the transfer case mating surface. Test fit the transfer case to the adapter flange. Once you're satisfied with the assembly, apply a thin skin of RTV or other preferred sealant to the gasket surfaces and assemble

Transfer Case Clocking & Driveshaft Clearance

The 4L60-E features a very wide transmission pan, and clearance is very close to the driveshaft. Use the factory size front driveshaft and yoke. We have designed the adapter to be compact as possible, and driveshaft clearance to the 4L60-E pan is tight, but will invariably

clear if the engine is offset (as discussed earlier) and if you are using the factory size front shaft. We get several calls from customers, stating with surety that their driveshaft will not clear the transmission pan. We ask them if they've actually assembled it to completion and they usually tell us something like, "Well, not yet, actually." We get essentially an equal amount of follow-up calls stating, "Well, after trying it, it's close, but it does clear."

Mounting the Drivetrain Assembly

The best way to mount this adapter assembly is to use the Novak #RM103, which consists of a steel L-bracket and a urethane mount that is an improved reproduction of Borg Warner part #31-2268.

The crossmember itself can be the factory unit. Customers often ask if they must use a specially fabricated crossmember to accommodate a conversion. By moving the factory crossmember to the rear set of holes, and by drilling the crossmember for the above mentioned flexible mount, the 4L60-E can be very cleanly mounted. Note that installation to a rigid crossmember risks breakage of the transmission, adapter or transfer case. Your adapter's warranty will be voided in this scenario. Note that a metal spacer can be used under the rear mount to achieve the proper transmission height.

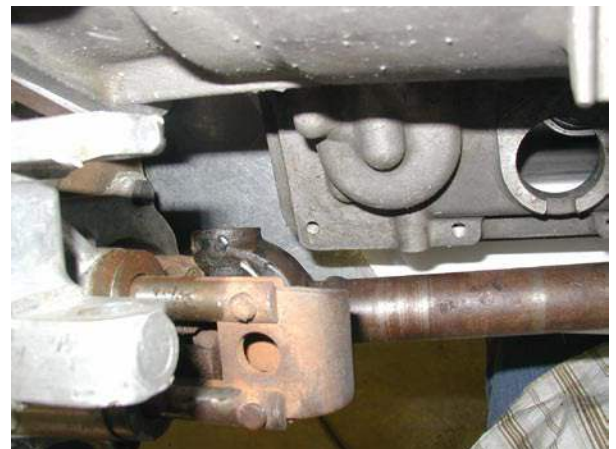
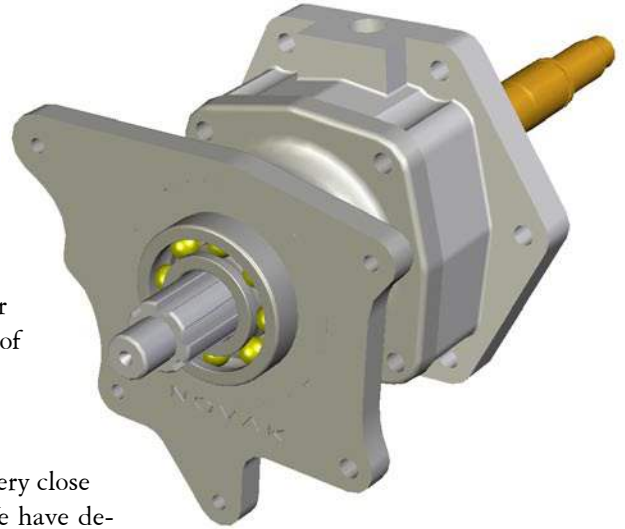
Installation of the 4L60-E will usually be in conjunction with a GM engine swap in most cases. It should be noted that the Jeep engine and transmission were not centered in the frame but offset about 1 1/4" towards the drivers side. To maintain

rear driveshaft alignment the new engine and transmission should be installed with this offset.

Rear Driveshaft

The rear driveshaft length will need to be changed to accommodate the swap. Also, consider that there multiple ways to install a conversion engine (often used with this transmission) and the following will be of note:

Finish mounting the transmission and engine and have the weight of the Jeep on the wheels when measuring the length to modify the





driveshafts. Any changes in driveshaft length must be determined after the engine and transmission have been mounted. The Jeep must be sitting on the ground with its full weight on the wheels to make the best determination. If a shackle reversal has been or will be performed on the Jeep, it is crucial that you calculate the suspension geometry's effects on the front driveshaft. Shafts that are too long or

do not have enough compression slip will cause the driveshaft to ram your transfer case, causing damage to your axle, driveshaft, transfer case, adapter or transmission. Our experience has shown that some stock Jeep drive shafts are not quite the correct length from the factory to begin with. This can be corrected if the driveshafts are modified.



Transfer Case Shifter Linkages

The Dana 18 & 20 shifters can be modified if necessary. A twin-stick conversion is likewise compatible.

Transmission Shift Linkages

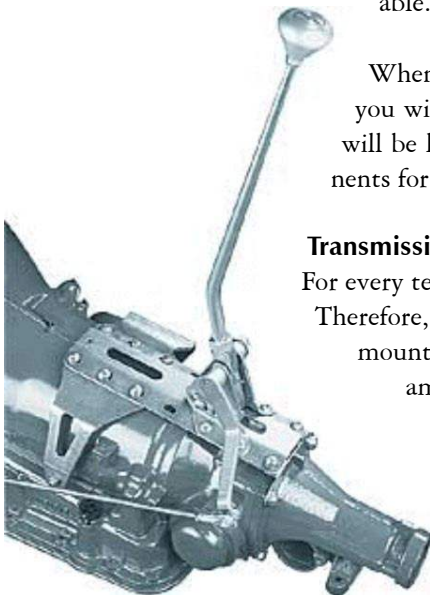
The transmission shift control unit can be cable operated with detent positions for all functions and should include a lockout so reverse cannot be accidentally engaged when moving. Several console type shifters of this type are made by B&M and are widely available. Models Z Gate, Star, and Sportshifter are good choices. Hurst Performance makes a similar line of shifters for automatic transmissions. Direct linkage stick shifters like the Gennie (1.626.337.2536 or www.gennieshifter.com) or Lokar (1.865.966.2269 or www.lokar.com) are excellent choices, especially where a manual transmission is being replaced and the transmission tunnel is configured for the manual. The look and feel of the latter style shifters is often preferable.



When replacing an automatic transmission, you will find that the factory linkage can be retained and adapted without difficulty, though you will be lacking two positions, precluding full functionality. To resolve this, contact Kugel Components for their stainless shift arm kit (1.562.691.7006 or www.kugelkomponents.com)

Transmission Cooling

For every ten degrees cooler you can keep the transmission, you can add 25,000 miles to its service life. Therefore, use of a transmission oil cooler is advisable for any automatic transmission. We do not advise mounting a cooler in front of the Jeep radiator, however, as the grille opening area is reduced by an amount relative to cooler size. A front mounted cooler can also cause air flow turbulence with resultant loss of engine cooling. A transmission cooler can be mounted in the engine compartment and still provide satisfactory cooling. The passenger side firewall or backside of the front fender (in the engine compartment) are suitable locations for transmission coolers. If so located, the cooler should be mounted as to allow airflow through it. In other words, don't mount it flat on the firewall or fenderwell. Some choose successfully to use a supplemental frame rail style cooler as well.



Use of a transmission temperature gauge is also a good idea. These are widely available and generally inexpensive.

Some Conclusions

The 4L60E and Mileage Benefits

A good part of GM's reasoning in developing the 700R was to allow more of their vehicles to meet ever stricter mileage and emissions requirements. It was an effective strategy. By converting to the 4L60E, your Jeep may realize significant mileage benefits as well. It is not uncommon for swappers of this transmission to see a 30% drop in fuel consumption if the Jeep sees highway use.

Additionally, the transmission features a lock-up torque converter to allow a direct, non-slip connection through the transmission. This has the benefit of further fuel savings and cooler transmission operating temperatures. However, it is crucial that this lockup mechanism be properly connected to the ECM and brake lamp circuit. Stand-alone computers are available on the aftermarket for its control. Some control units even allow for the lockup to occur at a given speed.

Lock-up converters in automatic transmissions give the advantage of direct engine lockup through the otherwise fluid-coupled transmission. This function works either by the ECM or a vacuum switch. Earlier versions without ECM use a vacuum switch connected to ported vacuum. The transmission receives the signal and applies fluid pressure to the clutches in the lock-up converter. The system switches off due to a signal from the brake pedal. If you run the transmission with the converter unlocked all the time it will run a little hotter. Keeping it cool is important. The advantage of this lock-up converter is increased fuel economy and decreased heat at cruising speeds.

If you would like to simplify the stock set-ups, torque converter controls are available through racing supply retailers in a variety of styles. These facilitate the proper installation of the TH350 and 700R4 and 4L60E.

The on-road advantages are obvious. For the off-roader, the ability to manually switch the torque converter on is excellent in that it allows for compression braking.

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 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 the 4wd retailer or technician you bought the kit from, or if you bought your conversion kit directly from us, contact us and we'll be happy to assist.



Much a part of the transmission is the Powertrain Control Module. GM has scored another hit with this intelligent set-up, that puts the engine and transmission under the same management. Standalone transmission controllers do exist on the aftermarket, however it is typically better to run the OBDII / Generation III) engine and trans as a matched pair.

Because the transmission is electronically controlled by the PCM and its requisite wiring, it is usually simplest to join the 4L60-E to the engine it came with from the factory. Earlier engines can be joined to the 4L60-E by use of a GM Controller, #12497316. Carbureted engines will require a Throttle Position Sensor.



We've had many customers request it, and we've made available our Dana Transfer Case Rebuild kits. We welcome you to call us or see our website for details.

Dissassembly of the Dana transfer case is not required for this conversion, but many individuals wanting an entirely fresh and optimized powertrain find this a good time to do so.

Changes to your vehicle may be restricted by varying local laws. It is the installer's responsibility to verify these laws and regulations as applicable to their vehicle. These components provided are made for off-road use only.



Air pollution laws vary from state to state. Changing an engine or transmission in your vehicle may change its pollution status. It is the customer's responsibility to determine that their vehicle conforms to whatever state and federal regulations that may apply to their vehicle. Neither Novak, Inc. nor its directors are responsible for any changes made to your vehicle.

Bill of Materials for Novak Kit #4L62

- 1 x Casting, adapter, #103
- 1 x Adapter, #4L62. Adapting the 4L60E (later version) to the Jeep Dana 18 & 20 transfer cases
- 1 x Shaft, adapter, #103. Adapting the TH transmission to the Dana Models 18 & 20 transfer cases
- 1 x Bearing, deep groove ball, single row, #6209
- 1 x Bearing, deep groove ball, single row, #6307
- 1 x Ring, snap, retaining, 1.750" shaft x .109"
- 1 x Seal, oil, #331107N
- 1 x Nut, 7/8-16, lock, Jeep / Dana mainshafts
- 1 x Washer, 7/8, flat, Dana 18/20 interfacing mainshafts
- 4 x Bolt, 3/8-16 x 1-1/4, hex head, grade 5, zinc plated
- 4 x Stud, 3/8"-16 x 2", fully threaded
- 9 x Washer, split lock, 3/8, zinc plated
- 1 x Seal, o-ring #1358899
- 1 x Sensor, Vehicle Speed (VSS) 40T retractor style
- 1 x Ring, retractor, 40 tooth

Optionally Selected Items

- 1 x Gasket, Models 18 & 20 front face, 4" bore or 3-5/32" bore
- 1 x Retainer casting, T86 & T14 rear bearing, cup style, 4" bore
- 1 x Ring, snap, retaining, Dana 18 / 20, 4" retainer



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