

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 4L80-E transmission to the Jeep® New Process 231, 242 & 249 transfer case, as found in 1987 to 2011 Jeep vehicles.

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.

Identification

First off, you need to know the model year of and if you are working with a 2wd or 4wd 4L80E assembly and how/why these important details are needed to know in order to setup your 4L80E correctly.

To determine the model year, refer to either of the ID tags located on the right side of the case. If your case has the transmission cooler lines located both towards the front, this would be a pre-1997 model. In 1997, the return line was moved more towards the center of the case. As seen in the photo above and to the right, the white tag that reads "4BSP" would indicate that this is a 2004 model case (if the return line is by the supply line {pre-'97} this would make it a 1994 model case). There is also a metal tag on the passenger side towards the rear that will indicate the year (this example tag reads "04 3 352", also indicating it is a 2004 model).

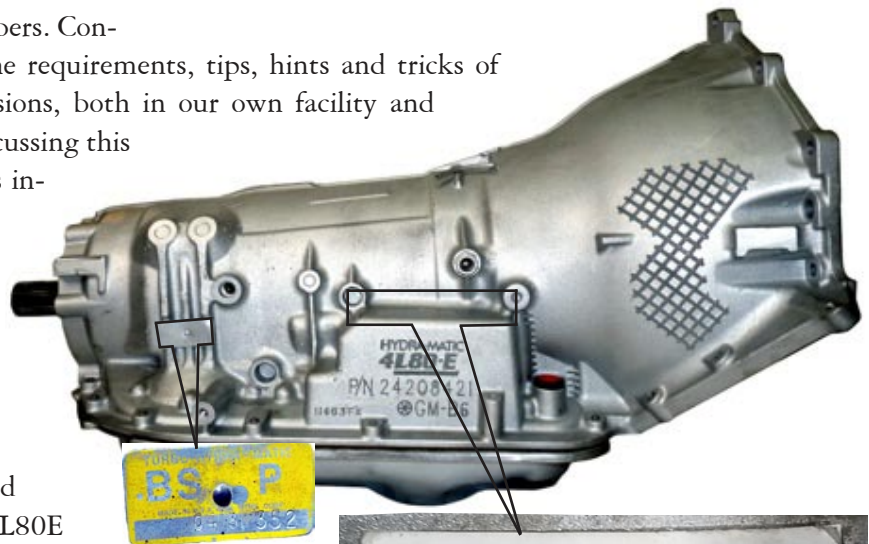
Now, one way to determine if your 4L80E donor case is 2 or 4wd would be what type of plug is installed in the rear of the case. Looking at your transmission from the rear (staring down the barrel of the output shaft), at the 3 o'clock position will be a plug (plugs seen in image, left). If your case is a 2wd unit, it will have a plug with a pinhole in the center to allow lube to reach the extension housing. If your case is a 4wd unit, it will have an expansion plug with no pinhole. You will need to make sure you have this 4wd plug installed, which we have included in every 4L81 adapter kit.



Another critical factor to know in regards to these two versions ('91-'96 & '97+) is that you have the correct version of output shaft. The first (early) design shaft has two lube holes in the sides of the case bushing journal. Lube flows from the pipe into the output shaft and forward to the planetary gears.



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The second design shaft does not have these lube holes. Installing a second design shaft (no holes) into a first design unit will stop lube and cause planetary meltdown. This second design shaft (no holes) is lubed by a small tube from the valve body. Oil from the tube lubes the case and extension housing bushing only. Installing a first design shaft into a second design unit will cause lube and actuator feed oil to mix.



Lastly, the 4L80E transmission may feature two speed sensors, one for turbine input speed and one for output speed. The 1991-1996 4L80E, both 2wd & 4wd, utilize both the front and rear VSS on the transmission case. The 2wd units continue to use the reluctor ring and rear VSS, whereas the '97+ 4wd 4L80E does not use the rear sensor on the transmission since this signal was now available from the transfer case. When using a 4L80E that does not have this reluctor ring and rear VSS, it is necessary to install this reluctor ring and VSS for proper transmission operation/shifting. Novak can provide you the reluctor ring and VSS as well if you require it (part # 4L80-OSS).

Conversion Procedure

Novak offers five versions of the 4L81 adapter kit, so please follow the installation instructions below based on the kit part number you have purchased.

Note: Be sure that the output shaft seal is present and in good condition. The existing output shaft seal should be fine to reuse, assuming it is not damaged or leaking. Should you want or need to replace the seal, use GM part number 8675517. This can be purchased inexpensively through any local parts store, a GM dealership, or from any number of online sources.



Kits 4L81-AE & 4L81-AL Transmission Output Shaft Installation

Have your new Novak transmission output shaft installed by an automatic transmission specialist. Installation of this shaft requires disassembly of the transmission itself, though most major assemblies in the transmission can remain assembled. We anticipate a four hour bench job based on our work with these units. You may wish to have seals, gaskets, filters, etc. replaced during this process. If the transmission miles are high, a full rebuild may be indicated and this would be the time to do so.

Home mechanics can install the shaft if they are versed in automatic transmission repair, but the factory level manuals and a proper collection of specialty tools are required.



Kits 4L81-BE, 4L81-BL & 4L81-BJ Transfer Case Input Gear Installation

The adapter kit installation instructions will be the same for all 3 transfer case input gear versions (4L81-BE, -BL, & -BJ).

Upon disassembly of your transfer case, the input gear will be the last part removed. Because your transfer case will be so far disassembled, it may be worthwhile to rebuild the transfer case at this time. Novak can supply a rebuild kit for just about any transfer case, so if you wish to perform a rebuild at this time and have not ordered a rebuild kit you may call our Sales department and we'd be happy to help you order the appropriate kit.

Adapter Installation - All kit versions

Remove the original Hydramatic tailhousing or adapter (in the event that they came with the transmission). The adapter will now replace the original extension housing with the following notations: First, lube the transfer case input shaft bore splines before installing adapter. Assemble the adapter to the transmission as follows. Screw the six 10 x 1.5mm studs supplied with the kit into the back of the transmission case so they protrude 7/8" to 1". Use a thread locking compound, such as the small tube of Loctite™ Blue we have supplied in your 4L81 adapter kit.

Install the gasket (six-holed, with 2 flats, image right) on the front of the adapter. Install the six lockwashers and nuts and tighten 1/4 turn at a time until the adapter pulls up evenly to the transmission case. Tighten to 40 foot-pounds. It is a good idea to cross-tighten the nuts to torque in three sequential stages.



Transfer Case Installation

At this point, install the remaining, fully round, six-holed gasket on the face of the adapter to prevent ingress of contaminants. You should use a very light coat of RTV, but don't allow any to squish into the inner cavity of the adapter/transmission, as it will find its way into the transmission with destructive results. Assemble the transfer case to the adapter using the original bolts. Sequentially cross tighten these six bolts in stages to 35 ft. lbs. Note that some four-cylinder transfer cases have one stud missing. You can install a stud or bolt at this location if you wish.



Mounting the Drivetrain Assembly

The rear mount from the some YJ, TJ & XJ Jeeps could be used with some modifications, but we find this factory mount to be restrictive and difficult to work with. As such, we include our mount bracket (image, left) which is designed to offer a variety of mount placement options and pairs nicely with Novaks urethane rear mount. This is a Novak #RMU (image, below left), and will mount on the adapter using bolts, nuts and lockwashers.



Customers often ask if they must use a specially fabricated crossmember to accommodate a conversion. No. The crossmember itself can be the factory unit, or an aftermarket or custom "flat-style" skid plate. By drilling the crossmember for the above mentioned flexible mount, the 4L80-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, especially applicable when using a factory skid member.

Driveshafts

Most factory transmission and adapter combinations to the Jeep NP transfer cases vary. As such, it is often that driveshaft lengths will need to be changed to accommodate the swap. Also, consider that there are multiple ways to install a conversion engine (often used with this transmission) and the following will be of note:

It is seldom a good idea to allow the driveshafts to make the decisions as to where the powertrain will be placed. 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.

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.

Transmission & Transfer Case Linkages

The NP transfer case shifter need not be modified. The installer can keep the combination of rods and levers as per factory, however, we do offer our #SK2X and #SK2XC shifter kits to facilitate the install and make for a better shifting mechanism than factory. Our #SK2X shifter can be seen installed in the image below, right.

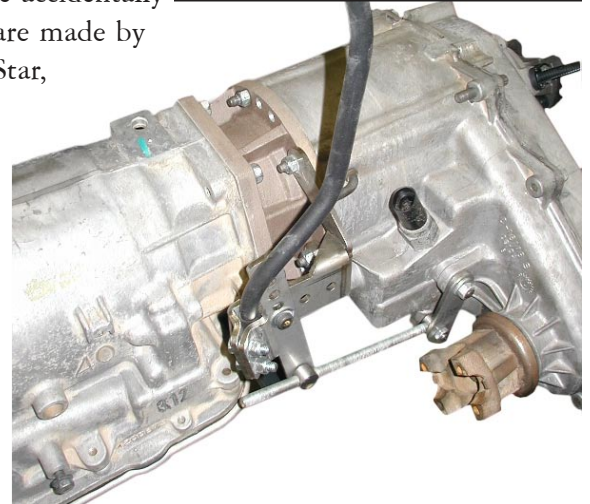
The transmission shift control unit can be cable operated with detent positions for all functions and should include a lockout so reverse cannot be accidentally engaged when moving. Several console type shifters of this type are made by

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 Lokar 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.



Lokar's 4L80E mechanical shifter, # XFMS64L80BB



Vehicle Speed Sensors & Speedometers

The VSS assembly will supply your ECM (or aftermarket standalone 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 earlier (pre-'93) Jeep NP transfer case output assembly. This will facilitate keeping your existing Jeep mechanical gauges.

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.

The simplest cooling solution, in terms of the transmission and the likely engine conversion you are performing with it is the Novak RadLock radiator. They are available for all YJ & TJ Jeeps with an integrated transmission cooler. Don't hesitate to contact us if you'd like further details.

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

Some Conclusions

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 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.

About Your Novak Adapter

The Novak #4L81 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 adapter shaft 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.



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