

## Introduction

We hope the installation of your Novak adapter assembly goes smoothly and that you achieve the desired improvements with your Jeep®. This kit adapts the GM HydraMatic 4L60-E transmission to the Jeep® Dana Model 300 transfer case, found in 1980-1986 Jeep CJ Universals.

Regardless of your experience level, we strongly advise you to read these instructions thoroughly and save them for future reference. These instructions include requirements, tips, and tricks from years of performing these conversions and customer feedback. Use this information to your advantage.



## About the 4L60-E Transmission

The 4L60-E is an automatic, four-speed overdrive, longitudinally positioned transmission, regarded as the best overdrive automatic transmission ever produced.

### History

The 4L60-E evolved from the Turbo 700R, introduced in 1982. It is the electronically controlled version of the 4L60. The Late 4L60-E, released in 1997, was widely adopted by GM by 1998 in both RWD cars (including the C6 Corvette) and trucks in 2WD and 4WD configurations.

The transmission's core mechanics are the same as its predecessor, but with an electronically controlled valve body and actuation system. A Vehicle Speed Sensor (VSS) provides feedback to the PCM/ECM for shift decisions. This system is considered an elegant improvement.

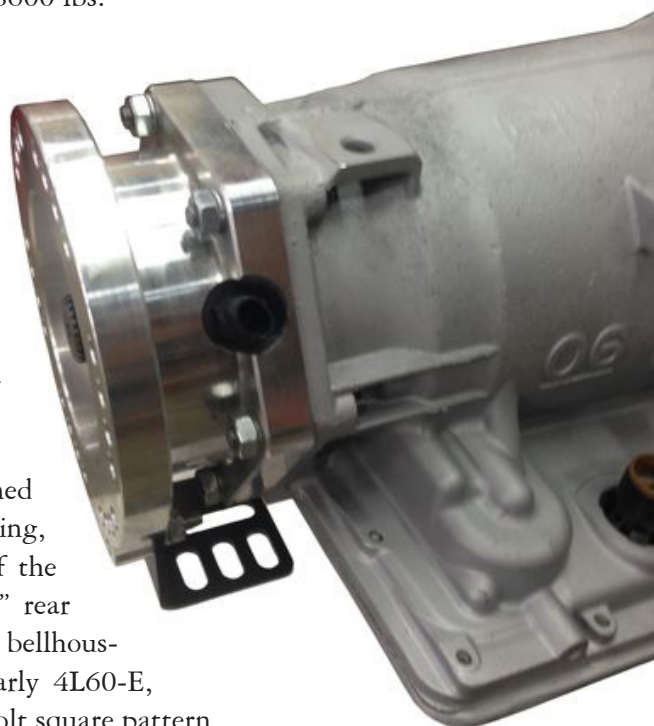
The 4L60-E is named for its specifications: 4-speeds, Longitudinally positioned, 6000 lbs. GVW, Electronically controlled, though it can service trucks up to 8600 lbs.

The 4L60-E is known for its strength and is highly regarded in the transmission aftermarket, capable of handling significant power in both truck and performance car applications.

### Identification

The Late 4L60-E transmission has a three-piece cast aluminum alloy case: bellhousing, main case, and tailhousing. It is 21.9" long, equivalent to a 15.4" manual transmission.

Key features include a 30-spline input shaft, pinned flare & o-ring fittings on the passenger side for cooling, and a square oil pan. Distinctive characteristics of the Later 4L60-E (1997-2006) include a six-bolt "hex" rear output/tailhousing adapter pattern and a removable bellhousing, differing from earlier versions (1992-1997 Early 4L60-E, 1990-1992 4L60, 1982-1989 700R4) with a four-bolt square pattern.





The new style 4L60E was released in 1996, featuring a hex pattern rear face and removeable bellhousing. Be careful to verify this feature as some confusion can occur between GM's earlier 4L60E with the four-bolt pattern. Some truck 4L60E's did not update until the 1998 model year.

Two-wheel-drive versions have longer output shafts compared to the shorter ones in four-wheel-drive versions.

The transmission weighs 146 pounds dry and 162 pounds wet. It requires 8.4 quarts (9.64" torque converter) or 11.4 quarts (11.81" torque converter) of Dextron III fluid, with deep pan versions needing up to 14 quarts.

The 4L60-E is commonly found in GM rear-wheel-drive applications, including the C/K Truck, Sonoma, Jimmy, Tahoe, Yukon, Astro, Safari, Suburban, Bravada, Firebird, Camaro, and Corvette.

### Transfer Case Adaptability

The 4L60-E transmission is highly adaptable to most Jeep transfer cases, making it an excellent choice for conversions. Both 2WD and 4WD versions can be used equally well with our adapter assembly.

Factory GM 4WD applications with an OEM 4L60-E

have adapters and transfer cases that are typically too long for Jeeps and have less desirable sizes, strength, and gearing. These GM transmissions mated to the Chevy NP231 (231C) transfer case have a different bolt pattern and spline count than the Jeep NP231 (231J).

### Engine Compatibility and Adaptability

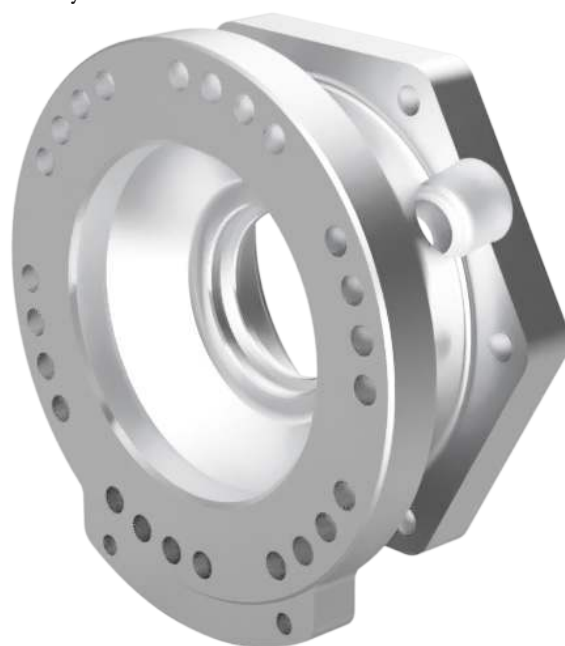
#### GM

The 4L60-E transmission is natively compatible with Chevrolet 90-degree "Small Block" & "Big Block" engines, including V6, V8, and I6.

For simplicity, it is best to pair the 4L60-E with its original engine due to the electronic control by the PCM. Earlier engines can be used with a GM Controller (#12497316). Carbureted engines will need a Throttle Position Sensor. For non-GM PCM controlled engines, consider the TH700R-4 as a simpler, cost-effective alternative.

### Summary

The 4L60-E is highly respected for its strength, quality, and versatility, making it a compelling choice for Jeep conversions. It is suitable for all Jeeps except the CJ5 and other short-wheelbase models due to powertrain length and driveshaft angle issues. Adaptability to most Jeeps is exceptional.



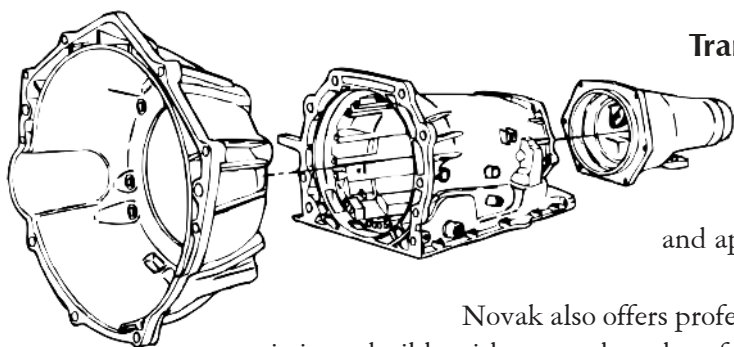
The Novak 4L60E to Jeep Dana Model 300 adapter is one of our most significant adapter designs released to date. It is the most compact on the market at 3" long for a combined transmission and adapter length of 24.5".

Included with this kit is a new output shaft for the 4L60E. It is machined from a solid bar of alloy gear steel for strength far surpassing used friction welded output shafts currently on the market.

We've also taken the hassle out of setting up elaborate VSS (Vehicle Speed Sensor) systems by including the sensor (installed) and reluctor ring with the adapter assembly. Seals, gaskets, o-rings and hardware are also included.

Of interest is the clocking of the Dana 300 transfer case; we've achieved the optimum clocking for better ground clearance without compromising driveshaft to pan clearance. Note that you should use your stock size front drive yoke and shaft.

# Conversion Procedure



## Transmission Output Shaft Installation

You can have your new Novak transmission output shaft installed by a specialist, requiring disassembly of the transmission. This typically takes four hours. If you choose to install it yourself, use a factory service manual and appropriate specialty tools.

Novak also offers professional installation of the output shaft, as well as full transmission rebuilds with strength and performance upgrades, ensuring optimal performance and durability.

If you prefer to install the Novak 4L60-E output shaft yourself, do so with the assistance of a factory service manual. A few specialty tools may be required.

## Adapter Installation

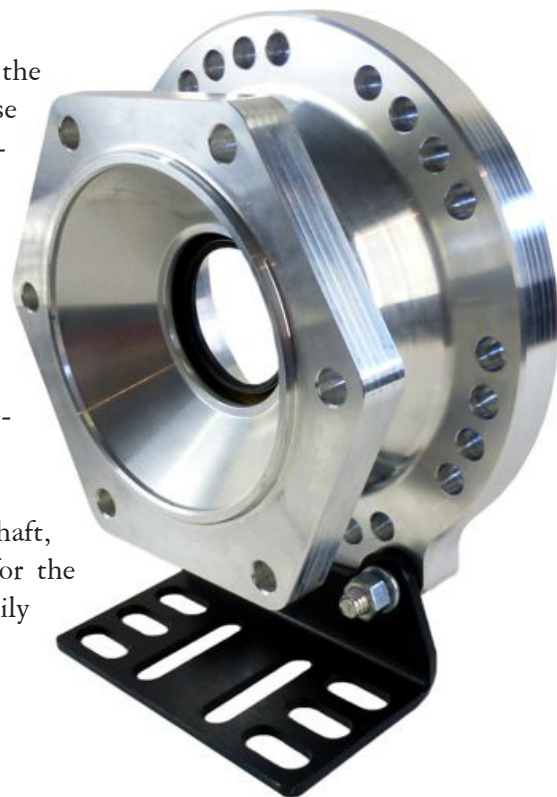
1. **Remove the Original Tailhousing:** Remove the original Hydramatic tailhousing or adapter from the transmission if still present.
2. **Install the Reluctor Ring:** If not already installed, place the steel reluctor ring onto the transmission output shaft, ensuring the teeth are positioned under the hole in the adapter. Its' press or clamp fit is sufficient unless removed with a puller.
3. **Prepare the Adapter:** Lube the transfer case input shaft with bearing grease to prolong spline wear. Test fit the adapter to the transmission flange; it should fit snugly with minimal side-play. Remove the adapter and install the square-section o-ring onto the adapter's locator step. RTV is optional but the o-ring will suffice for sealing.
4. **Install the Adapter:** Bolt the adapter to the transmission using the six supplied 10 x 1.5mm studs, leaving about 1" protruding. Use thread locking compound, such as Loctite™ Blue, on the transmission flange threads. Attach the adapter with the six supplied lock-washers and nuts, tightening to 40 foot-pounds in three sequential stages.



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.

## Transfer Case Installation

1. **Prepare the Transfer Case:** Clean the transfer case surface with sandpaper and a small block of wood to ensure a proper seal. Remove rust and dirt from the mounting face.
2. **Install the Input Shaft:** Use your factory 23 spline input shaft, greasing it before assembly. Install the supplied face gasket for the Dana 300. RTV is optional. The gasket is reusable and primarily prevents dust and water infiltration.





3. **Clocking and Driveshaft Clearance:** Use the third-from-the-top clocking option on the transfer case flange of your Novak adapter housing. Ensure the engine is offset  $\sim 1\text{-}1/4"$  to the driver's side for driveshaft clearance. Assemble the transfer case to the adapter using the original bolts or grade 5 (or better)  $3/8\text{-}16$  fasteners, tightening to 35 ft. lbs. sequentially.

## Mounting the Drivetrain Assembly

1. **Rear Mount Installation:** Use the rear mount from a Muncie truck four-speed or a Novak #RMU (urethane) mount. The adapter is drilled to accept the regular two-bolt rear mount used on a wide variety of GM applications. Attach the mount using bolts, nuts, and lock washers, along with the provided stainless steel mounting foot. Avoid mounting rigidly to the crossmember to prevent breakage of the transmission, adapter, or transfer case.
2. **Crossmember Installation:** The factory crossmember can be used by moving it to the rear set of holes and drilling for the flexible mount.
3. **Engine and Transmission Offset:** Install the engine and transmission with a  $1\text{-}1/4"$  offset towards the driver's side to maintain rear driveshaft alignment.



## Driveshafts

- **Modification Requirements:** Driveshaft lengths may need to be modified for the swap. Measure and modify driveshafts after the engine and transmission are mounted and the vehicle is on its wheels. Driveshaft modifications are usually inexpensive and can be performed by driveline specialists. Ensure proper suspension geometry to avoid damage to the axle, driveshaft, transfer case, adapter, or transmission.
- **Front Driveshaft Clearance:** The engine must be installed offset to the driver's side. Use the factory  $1\text{-}1/4"$  front driveshaft diameter. The transfer case front output yoke and corresponding driveshaft yoke must be the factory, low-profile style. The front axle should not be narrower than the factory width.
- **Special Considerations:** In some situations, the front pan may interfere, particularly in the last two years of the CJ's production run. A notched front pan as shown above is available from Novak for these installations.



## Transmission and Transfer Case Linkages

- The Dana 300 shifter does not need modification. A twin-stick conversion is compatible.
- The transmission shift control unit can be cable-operated with detent positions and a reverse lockout.
- Several console-type shifters (e.g., B&M Z Gate, Star, Sportshifter, Hurst Performance, Gennie, Lokar) are compatible and provide excellent options.

## Vehicle Speed Sensors and Speedometers

- The supplied VSS ships only finger tight in the adapter. Snug it up with a deep socket and verify reluctor ring to sensor clearance with feeler gauges (typical gap:  $.015"$  -  $.030"$ ).
- The included VSS assembly will provide the ECM (or aftermarket standalone computer) with the necessary information to run the transmission.
- You can simply retain the mechanical speedometer of the Dana 300 for your gauges.

### 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.

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.

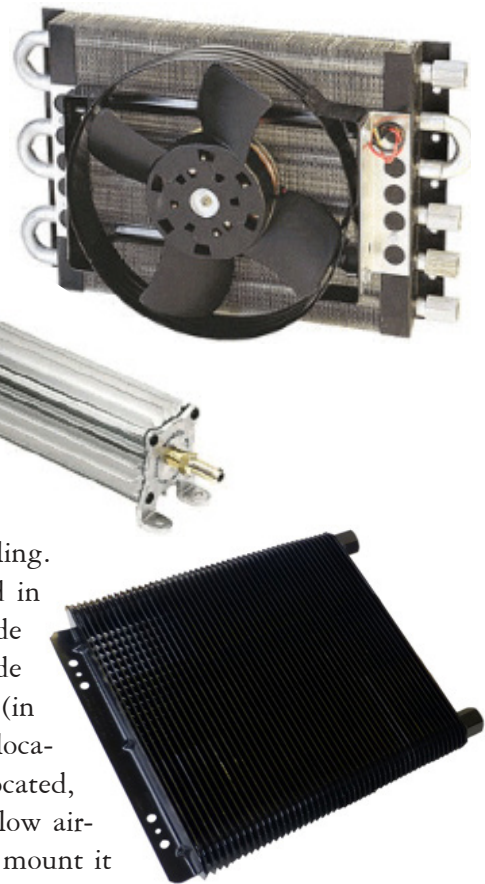
### Transmission Cooling

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 air flow 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

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,



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.

Dissassembly 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.



### About Your Novak Adapter

The Novak #4L63 adapter kit is built to high standards of design, materials, and build quality. The adapter housing is machined from 6061 billet for exceptional strength. Our adapter shaft is machined from triple-alloy gear steel, specially hardened and precision ground for durability and longevity.

The design of this adapter eliminates the need for a special transfer case front output yoke.

Novak warrants your adapter and shaft against defects in workmanship and materials for the life of the vehicle. This warranty is non-transferable and requires a copy of your invoice as documentation. The warranty does not cover damage or defects resulting from improper installation, including misalignment, improper assembly, incorrect mounting, incorrect driveshaft lengths, or miscalculated driveshaft geometry on shackle reversal setups. Since we cannot control how the parts are handled or installed, we are not liable for any issues unless they are due to defects in design, materials, or workmanship. Warranty determinations are at the discretion of Novak, Inc.

If you have any questions regarding this conversion or these components, please contact us.

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