Introduction

We hope that the installation of your new Novak adapter assembly goes smoothly and that you acheive the improved results with your Jeep® that you intend. This kit is for adapting the GM HydraMatic 350 transmission to the Jeep® New Process 231 or Dana 300 transfer case.

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.

About the TH350 Transmission

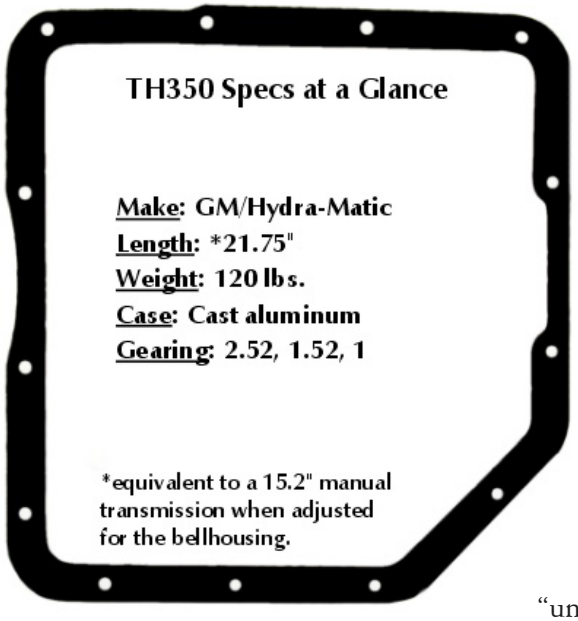
One of the all time transmission conversion favorites is the TH350 automatic as found behind Chevrolet and Buick / Olsmobile / Pontiac engines. The transmission was introduced in the 1969 model year as the successor to the GM Powerglide automatic transmission. The strength, versatility and size of this transmission - typically paired with Small Block V6 & V8 engines - make the TH350 an excellent swap into nearly every model of Jeep.

Jointly developed by Chevrolet and Buick, it is also referred to as the CBC (Chevy-Buick Combined) 350. The transmission was prevalent in nearly all GM, rear-wheel-drive cars and trucks through 1981 and was produced as the TH350-C through 1984. This later version had an electronic lock-up converter to increase fuel-efficiency at cruising speeds.

Identification

This medium duty transmission weighs 120 lbs. and is the shortest GM automatic transmission that can be put into a Jeep. The Turbo 350 is distinguished by its one piece cast aluminum case and its distinctive oil pan that is chamfered at the passenger side, rear corner. At the right rear of the case is the modulator. Note that TH350-C lockup versions can be identified by an electrical plug on the left side of the transmission.

The HydraMatic 350 may vary in clutch pack and band specifications. As a general rule, transmissions found behind larger engines will have stronger specs. If your Turbo 350 came from behind a lighter duty motor, don't worry. These transmission can be affordably rebuilt with stronger components in nearly every area. Additionally, shift improver kits are



available to provide firmer, quicker shifts, reducing slippage, heat and clutch wear. There are also many styles of torque converter to better configure the transmission for off-road use.

Compatibility

Engine to Transmission: The front face TH350 is natively compatible with either the Chevrolet 90 degree "Small Block" & "Big Block" patterned engines, including the V6, V8, I6 & Iron Duke I4. Another version, the Buick / Oldsmobile / Pontiac (BOP) TH350 will be compatible with the Buick 90 degree V6 & V8 engines, and the Olds & Pontiac 90 degree V8. This "BOP" version features a "valley" at the twelve o'clock position of the block flange where the peak would be on the Chevy (pictured) version.

These differences only affect the front bell of the case, and all TH350 cases are similar from that point back. Note that there are dual-pattern "uni-cases" compatible with both the Chevy and BOP style engine blocks.

The TH350 can be made compatible with a variety of AMC I6 & V8 engines. See our Kit #437AMC for details. This great new kit can help make for a good Jeep powertrain.

Transmission to Transfer Case: Both 2wd and 4wd transmissions are or can be made to be compatible with a variety of transfer cases. 2wd transmissions feature conical shaped tailhousings and an output yoke, which are replaced with a typically shorter 4wd style output shaft of varying lengths and spline counts, depending on the application. Essentially all factory 4wd applications available with an OEM configured TH350 have adapters and transfer cases that are prohibitively long for a Jeep, and transfer cases whose sizes, strength and gearing fall short of desirable for most Jeep applications.

Adaptability to the four major generations of Jeep transfer cases is excellent via the use of our adapter assemblies, which are designed for the ultimate in strength, compactness, precision, easy of mounting and longevity. Some of these applications require the use of an OEM 4wd output shaft, identified by its 27 spline shaft protruding 3/4" from the rear face of the case. Other applications are provided with the proper output shaft in the adapter assembly, interchageable into any 2wd or 4wd transmission.

The Novak TH350 to Jeep Model 231 adapter is one of our most significant adapter designs released to date. It is the most compact on the market at 1.1" long for a combined transmission and adapter length of 24.5".

Included with this kit is a new output shaft for the TH350. It is machined from a solid bar of alloy gear steel for strength far surpassing used friction welded output shafts currently on the market.

In order to acheive the strength and very compact length of this adapter assembly, and to avoid the hassles of changing input gears (whose gear cuts and bearing thicknesses vary unpredictably between years), we have provided a new output shaft for your TH350 transmission. The new Novak adapter assembly includes this proper output shaft, as specified by the customer as a 21 or 23 spline version. You should verify that this is correct by counting your transfer case input gear splines and test fitting the shaft before having it assembled into your transmission.

Conversion Procedure

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. Service manuals to consider are Ron Session's book is a classic; titled *Turbo Hydra-Matic 350,* is highly comprehensive (ISBN #0895860511). Also, Haynes manual #10360 (ISBN #1563921693) covers the rebuild in detail as well.

Adapter Installation

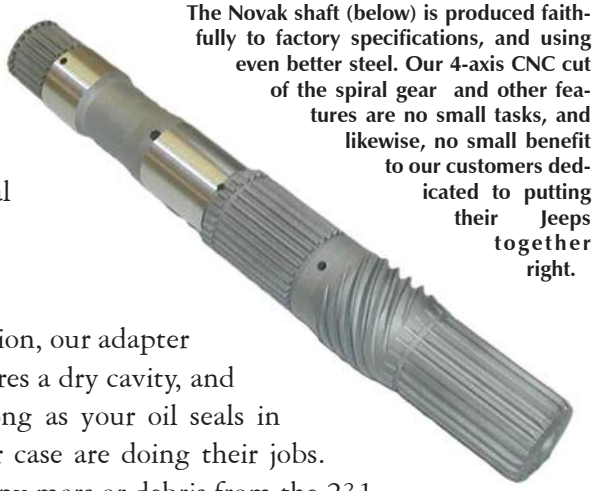
Remove the original Hydramatic tailhousing or adapter (in the event that they came with the transmission). The adapter will now replace the original extension housing. Make sure the transmission output shaft, transfer case input shaft and any other area that will be bathed in automatic transmission fluid - are completely clean and free of any particle that will interfere with proper transmission operation. Lubricating the splines of the shaft to transfer case input gear with a moly grease is required.

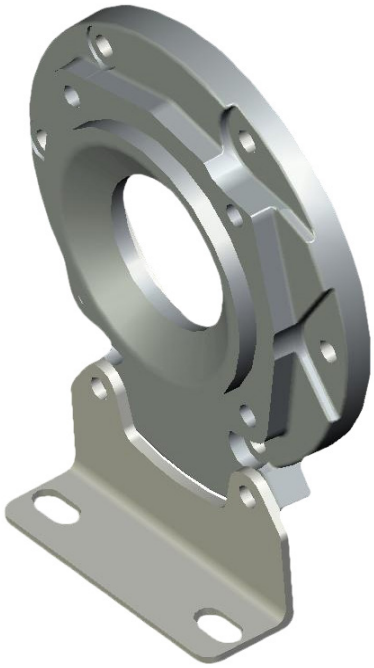
For D300 transfer cases (133 kit): Insert one 1-1/4" lenth bolt into the adapter hole that is behind the TH350 governor before installing the adapter to the transmission.

Install the transmission seal ring (square cross-section o-ring) onto the shoulder and against the face of the front of the adapter. Orient the adapter such that the cast in wrench clearance pocket is at the 9 o'clock position. Screw the four, 3/8"-16 x 1-1/4" Allen socket head bolts (supplied with the kit) into the back of the transmission case. The two supplied 1-1/8" length bolts will install in the holes furthers on the passenger side of the adapter. Use a thread locking compound, such as Locktite™ Blue. Tighten the bolts 1/4 turn at a time in alternating crossing patterns until the adapter pulls up evenly to the transmission case. Tighten to 35-40 foot-pounds. It is a good idea to cross-tighten the nuts to torque in three sequential stages.

We've seen three shafts broken like this one, and heard our customers speak of many more failures of output shafts made by other adapter companies. This is why we go through the trouble and expense of making our output shafts from a solid bar of alloy steel, instead of friction welding salvage GM shafts. A second, sometimes less obvious but pernicious problem is the issue of warpage during friction welding and heat treating, which cannot be corrected when the shaft journals are already ground and worn at or below factory specifications.

The Novak shaft (below) is produced faithfully to factory specifications, and using even better steel. Our 4-axis CNC cut of the spiral gear and other features are no small tasks, and likewise, no small benefit to our customers dedicated to putting their Jeeps together right.





The zinc plated steel foot, as provided with our adapter assembly, can be mounted in either forward (more directly under the transmission) or rearward (more directly under the transfer case) fashion, depending on your particular cross-member configuration. This mount is ready for a flexible rear mount of your choosing,, or optimally, Novak's #RMU.

Bolt Up the Transfer Case

As with the factory configuration, our adapter to transfer case interface features a dry cavity, and this should remain true so long as your oil seals in both the adapter and transfer case are doing their jobs. You may wish to lightly face any mars or debris from the 231 transfer case input face with a fine abrasive paper. You are free to marry the aluminum faces of the transfer case and the adapter together. We have also provided a gasket for this location for your optional use. If using the gasket, forego using any silicone sealant.

Secure the transfer case with 3/8" Allen socket head bolts provided. You may need to remove two of the odd-ball factory studs. Note that four-cylinder applications may have one of the six bolt holes plugged with a plastic stop, which is easily removed. As with any other operation, do not use the transfer case bolts to press the adapter and transfer case together. If they bind, check for alignment or obstructions. Torque to 35-40 foot pounds in crossing, sequential fashion.

About the TH350 Lock-up Torque Converters

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 setups, torque converter controls are available through racing supply retailers in a variety of styles. These facilitate the proper installation of the TH350 and 700R4.

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

Mounting the Drivetrain Assembly

Based on our discussions with our callers, this is one topic that receives an inordinate amount of worry. Reinventing the wheel here is usually completely unnecessary. Most installations very successfully use the factory crossmember / skidpan for mounting the gearboxes. Every installation, without exception, must use a flexible, compressible transmission mount, also referred to as a rear motor mount.

The adapter comes provided with a zinc plated steel foot and two 3/8" anchor studs. The foot can be oriented and installed either in the forward or rearward position, depending on how it will best fit your situation with your particular installation.

This popular rear mount is what we design our adapters to. It is a common Jeep/Chevy application and well supported by the aftermarket. This one pictured is our favorite, under the Novak #RMU designation.

You will need to drill two holes in the factory crossmember for the lower (narrower) portion of the mount base. A block or box spacer under this mount is sometimes required to acheive the right tilt and tunnel clearance to the powertrain. In some cases, you may wish to relocate the crossmember forward on the frame, especially if you are working with a conversion engine that sits further forward than the factory Jeep options.

We have seen certain instances of customers or their fabrication shops making custom, bar style crossmembers whose outer portions are anchored by step bushings and bolts on the frame. These bars are then bolted directly to the adapter base. This is usually done for the sake of ground clearance. This is a bad idea. While these side bushings may offer some lateral absorption, they offer virtually no longitudinal give. This risks breaking your transfer case, your adapter or your transmission. Stick with a mount as illustrated. If you must use a highly custom solution, make sure it is thoughtfully engineered to generously absorb shock and twist along every axis, including recoil.

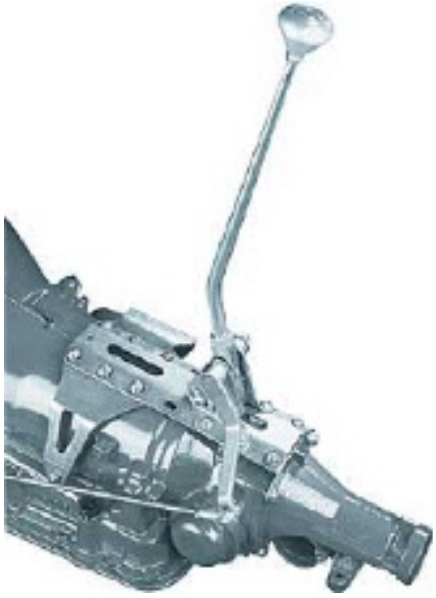
Driveshafts

Most factory transmission and adapter combinations to the 231 vary. As such, it is often that driveshaft lengths will need to be changed to accomodate 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:

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

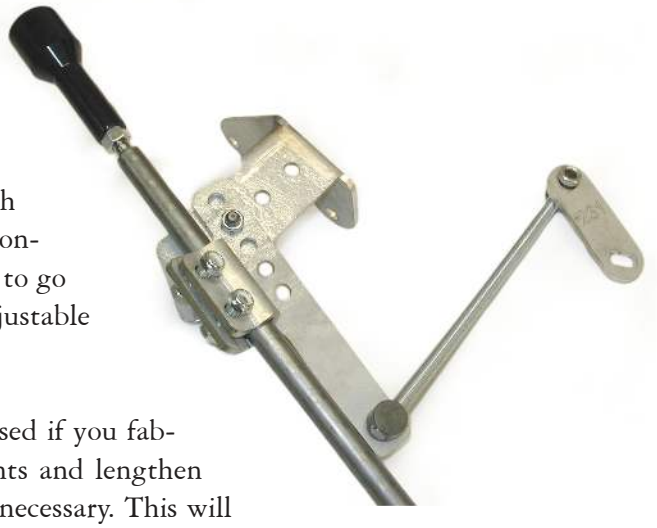
to modify the driveshafts. Any changes in driveshaft length must be determined after the engine and transmission have been mounted. The Jeep must be sitting on the ground with its full weight on the wheels to make the best determination. If a shackle reversal has been or will be performed on the Jeep, 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 Shifters & 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.hotrodhotline.com/gennie) 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. Your factory shifter may have one more position than is available for use with the TH350.



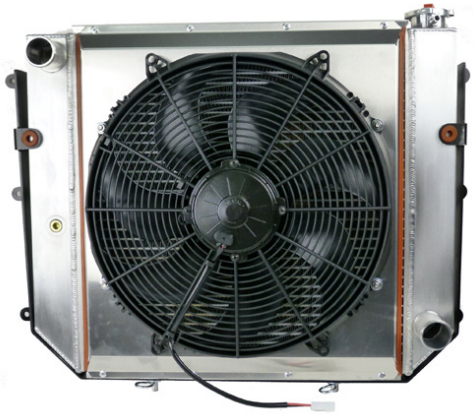
Transfer Case Shifter and Linkages

Our adapter kit has been designed to work in conjunction with our #SK2X transfer case shifter assembly. This affordable, convenient and solid shifter upgrade is simply the very best way to go when performing a conversion of this nature. It is fully adjustable and broadly configurable .

However, the stock linkage can be used if you fabricate and modify the anchor points and lengthen and shorten the shifter rods as necessary. This will prove time consuming, but can turn out well. Since there are three major linkage systems in these Jeeps, you will need to tailor yours to best suit the project.

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.

Because modern engines run a bit hotter than earlier engines and automatic transmissions prefer to be kept at cooler temperatures, we at Novak have decided to offer radiators without an integrated automatic transmission cooler option. These coolers are more effective run as separate units. This is a method that is confirmed by trends in the OEM automotive industry.

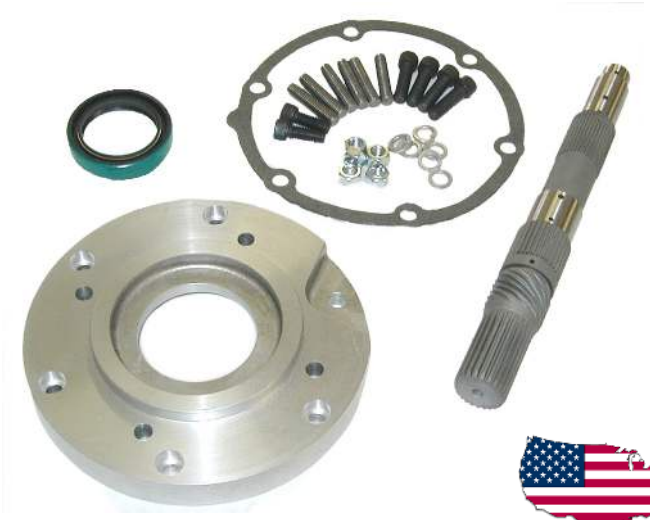
Use of a transmission temperature gauge is also a good idea. These are widely available and generally inexpensive.

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.

Conclusion

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 drive train conversions that cannot be anticipated. When executed with care, this conversion can be a strong, enjoyable and reliable upgrade to your Jeep.

We strongly suggest that you keep these instructions for future reference. For questions concerning your conversion, contact the 4wd retailer or technician you bought the kit from. If you bought your conversion kit directly from us, contact us and we'll be pleased to answer your questions.



There is no final word to our instruction packages. We update them often and invite our customers to offer any suggestions, images or questions they may have that can make the process easier for any to follow. Note our contact information below. We will be happy to answer your questions.

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