

Introduction

We hope that the installation of your new Novak adapter assembly goes very smoothly and that you achieve the improved results with your Jeep® that you intend. This kit is for adapting the Turbo Hydra-Matic 350 to the Jeep® Spicer Models 18 & 20 transfer cases, as found in 1946 to 1979 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. Failure to implement the practices and information in these pages may jeopardize the quality of your work, as well as the product warranty.



About the TH350 Transmission

One of the all time transmission conversion favorites is the TH350 automatic as found behind Chevrolet and BOP engines. The transmission was introduced in the 1969 model year as the successor to the Powerglide automatic transmission. The strength, versatility and size of this transmission, typically paired with Small Block 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 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.

Identification

This medium duty transmission weighs 15 pounds less and is 2.5" shorter than the TH400. This is the shortest GM automatic transmission that can be put into a Jeep. The 350 is distinguished by its one piece cast aluminum case and its distinctive oil pan that is chamfered at one corner. At the right rear of the case is the modulator.

The TH350 comes in several versions of which the buyer should be aware. The Chevrolet versions (pictured) have a unique case only compatible with the Chevrolet block style. Buick, Olds & Pontiac versions shared a case style of their own, with a "valley" where the peak would be on the Chevy style. This only affects the front bell of the case, and all TH350 cases are similar from that point back. Note that there are dual-pattern cases compatible with both the Chevy and BOP style block.

Other distinctions to make about the TH350 are its clutch pack and band specifications. As a general rule, transmissions found behind larger engines will have stronger specs. If your 350 came from behind a lighter duty motor, don't despair. These transmissions 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. Note that TH350-C lockup versions can be identified by an electrical plug on the left side of the transmission.



Compatibility

A notable and crucial difference is that of the transmission output shaft. If the transmission being installed in your Jeep came from a GM 4wd then it already has the requisite short output shaft. The proper shaft is identified by its protruding only 3/8" from the rear of the main case (with the tail housing removed). However, all TH350's that came from passenger cars or other two-wheel-drive vehicles must have the 4wd style output shaft installed before the adapter can be used. In order to do this, the transmission must be completely disassembled to install the short output shaft. This output shaft is GM part # 8641088. If you are unable to locate this item, don't hesitate to contact us.

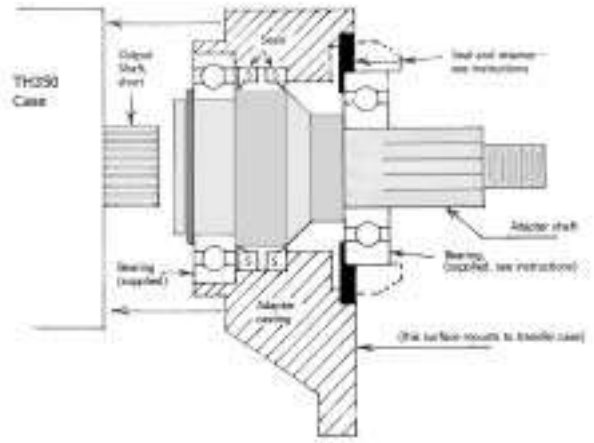
We keep a supply of new and select, used shafts for this purpose. Do note that some aftermarket shafts are not always machined to proper specifications. GM shafts have a more consistent spline work, which is important as we test fit our conversion shafts against factory originals.

Adapter Installation

Your adapter has been pre-assembled at our facility. You should first, trial fit the adapter to the rear of the transmission case,

leaving the seal ring off to make certain the adapter mates up easily and squarely to the TH350 case. Pay particular attention to the splined shafts and how they mate up. There is a certain amount of variation in factory shafts due to wear and other factors. We have splined our shaft tight enough to virtually eliminate both wear and the risk of breakage. Make sure your TH350 output shaft splines are clean and free of rust. You may need to polish or clean the factory splines. Do make sure they slide firmly together, but by hand. Do not use the adapter bolts to bring the assembly together. They should slide with nothing more than minimal resistance. Once trial-fitted, grease the shaft splines before final assembly.

Remove the adapter and install the seal ring on the adapter shoulder making sure the ring is not twisted. Install the four studs we've provided into the transmission rear face. A light coat of Loctite® Blue thread locker is recommended on the threads that engage the transmission rear flange. Reinstall the adapter followed by the four lock washers and cross-tighten the four nuts supplied to 35 foot-pounds of torque. It is a good practice to tighten to torque in three successive stages.



Transfer Case Installation

Now apply a thin coat of gasket sealer on the adapter and transfer case faces. Install the gasket followed by the transfer case using the original bolts. Install the input gear, washer and locknut. Tighten the nut to 125 foot pounds. Do not use an impact wrench. To facilitate this, put the transmission in fourth and reverse gears to lock the shaft from turning. However, if you are using a Warn overdrive, just slip it onto the shaft and tighten the special nut with a 1/2" drive ratchet extension. Carefully install the special snap ring, making sure it seats firmly into its grooves.

Engine Concerns

Be advised that most original Jeep engines are not mounted in the center of the Jeep frame. If the conversion engine is not mounted in the same offset manner that the Jeep engine was, front drive shaft to transmission oil pan clearance will be a problem. On 1971 and older CJ models, the original 4 cylinder engine was offset 2 1/2" towards the driver. The conversion engine and 350 trans should be shifted 1" back towards center (not on center). *This will still leave the conversion engine and transmission offset towards the driver 1-1/2".* If the front drive shaft hits the front corner of the TH350 oil pan, it is because engine placement is not correct. Check this before final engine placement is made. You may wish to consult our guide on engine installation for further informative details.

Mounting the Drivetrain Assembly

The original Jeep rear cross member (or skid pan-cross member on 1976 and newer CJ's) is usually used to support the rear of the TH350 transmission. The regular TH350 transmission mounting pad and rear cushion should be used with a spacer or pedestal type bracket to go between the cushion and the Jeep cross member. For most installations this bracket will usually be about 4" tall. We have these spacers available if you'd prefer not to fabricate your own. Installation may vary on 1976 and newer skid pan types, depending on the configuration and whether the pan is mounted in the front or rear set of bolt holes on the bottom of the frame.

On installations that used a side mount on the transfer case, such as early CJ's, the right side of the cross member must be spaced down to accommodate the rotation of the transfer case that is built into the adapter for driveshaft clearance. When attaching this mount, as with any other, flexible insulators must be used. These are common at most parts stores as donut style motor mounts. With these components angled correctly (and with the motor installed properly), front drive shaft to transmission oil pan clearance is attained. On models where this side bracket is removable, such as Utility series models, the bracket can be shortened and the cross member attached to the frame normally. Finish mounting the transmission and engine.

About Your Novak Adapter

The Novak # 103 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. Your adapter kit has been shipped fully assembled with seals and bearings installed and lubricated for initial spin-up.

The design of this adapter is such that it is slightly longer than other adapters on the market. As such and unlike shorter designs, it precludes the need to buy a special transfer case front output yoke. This slightly longer length should have no ill-effect on driveshaft angles on any Jeep with up to 4" of lift.

Note that this adapter has been configured for your Model 18 small bore (Kit # 103-3) or for your large bore Model 18 or Model 20 (Kit # 103-4), as per your order. If you discover your kit is not correct for your transfer case locating bore, do not attempt to use it. While a 103-3 kit will fit on a large bore case, it will not register to center and in short order you will take out gears, bearings and seals, if not more.

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 warrantied 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.

Driveshafts

For this particular conversion, shortening of the rear and lengthening of the front driveshaft may be required on most installations. If you are using a shorter engine like the GM V6, then the amount of length change in your drive shaft may be minimized or eliminated by mounting the engine ahead somewhat in the engine compartment.

On all installations, the front drive shaft must be the standard 1¼" diameter tube to clear the transmission oil pan. Install the front drive shaft with the slip yoke at the differential. The rear drive shaft will have to be shortened and the front lengthened on vehicles that have limited space in the engine compartment, such as pre-1972 CJ's. Engine placement is critical for proper front drive shaft clearance. The front drive shaft must be parallel to the side of the TH350 oil pan. The front of the engine must be mounted high enough to provide proper front drive shaft to starter clearance.

We will emphasize here that if you do not install the motor in this offset position, your front driveshaft will hit the TH350 pan. We get several calls every year from customers who have concerns about this. Invariably, they have attempted to center the motor, or they have not offset it as much as directed. When installed correctly, the shaft will be close, but it will not hit the pan.

Note now that 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 drive shafts. 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 play 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

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. Direct linkage stick shifters like the Gennie and Lokar are also 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 shifters is often preferable.



This is a fine installation. The powertrain is offset and parallel to the frame. The Model 18 has a good side mount and the installer has configured an oil cooler at the rear.

The dual side exhausts have fallen out of vogue in favor of a larger, single, rear-exit exhaust system. Apart from that, this is a textbook drivetrain conversion.

About the TH350 Lock-up Torque Converter

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 it allows for compression braking.

When replacing an automatic transmission, you will find that the factory linkage can be retained and adapted without difficulty.

This is a heat-sink style transmission cooler, Made by Moroso® and available through Jegs® and other performance parts retailers. They cool well, though not as aggressively as an active cooler.

Transmission Cooling

This is a PermaCool® transmission cooler. It is an excellent way to keep the tranny cool without interfering with the Jeep's primary cooling system.



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.

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, the TH350 conversion can be strong and reliable.

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. If you bought your conversion kit directly from us, contact us and we'll be happy to answer your questions.



Novak Kit # 103 includes:

- G *Casting
 - G *Adapter shaft
 - G *Adapter bearing, front, # 6209 C3
 - G *Adapter bearing, rear, # 6307 C3
 - G *Locating retainer, 4" or 3-5/32"
 - G *Snap ring, TruArc # 5160-175 (103-4 only)
 - G *Oil seals (2), National 331107N
 - G Seal, adapter front, Federal Transmission Parts # 3896L
 - G Lock nut, adapter shaft, Jeep # 940970, 7/8"-16
 - G Washer, adapter shaft, 7/8"
 - G Bolts (4), hex head, grade 5
 - G Adapter gasket, # 8179 (4"), # 8187 (3-5/32")
 - G Instructions
- * pre-assembled

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, nor the injury to the individual, or damage to property. Always exercise care and good judgement when installing this, or any other component on your vehicle.



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