

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 400 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 TH400 Transmission

The TH400 is a heavy-duty three-speed automatic transmission. It is an excellent transmission that converts well into CJ7's and longer wheelbase Jeeps. The TH400 was first released in Buicks in 1964. Chevy and the other divisions got theirs a year later. It is an immensely popular transmission in the automotive industry as well as the aftermarket. They are found in GM's, Jeeps, Jaguars, Rolls-Royces, Ferraris and others. They are very servicable, and buildable, not to mention their strength makes them a great conversion choice for Jeeps.

Identification

The TH400 is the largest of the common GM auto transmissions. The transmission measures 24.37" long. Its aluminum case is essentially smooth. The rear mounting face of the transmission has a hex bolt pattern with ribs running forward longitudinally. The fluid pan shape is irregular (see image, left), being likened unto a distorted Texas pattern. There are two significant variations of the TH400. The TH375 was a version of the transmission used from 1972-1976 in smaller displacement cars. It is identified easiest by its "375-THM" designation cast in the underside of the tail housing. The TH475 was an extra-heavy-duty version, and was found in larger trucks from 1971 on.

If you are trying to determine the TH400 from another in a vehicle, a fast way to determine it is to look at the kick down mechanism. The TH400 uses an electrical slide switch, which is controlled by the throttle linkage. The TH350 uses a mechanical cable kick-down mechanism that is attached to the throttle linkage.

An interesting variable pitch stator feature of the TH400 was available in 1965-1967 Buick, Olds and Cadillacs. These are identified by the two-prong plug on the case. While 1970-1974 models also had this plug, it is for the transmission controlled spark system.

Compatibility

The TH400 is most common in Chevy trucks and some GM cars. However the transmission was also sold to other car companies, including AMC Jeep. The first TH400's found in Jeeps had a factory adapter plate, while later AMC versions had a dedicated AMC style case. Internally, the transmission is the same and all parts are generally interchangeable. It is of interest that the AMC case, while more or less similar from the collar of the case, back, is tilted about four degrees. This was presumably for transfer case clearance purposes.

An additional advantage of the TH400 is the torque converter. While mechanical gearing in the transmission is high, the slip in the torque converter makes is a good off-road transmission.

TH400's do not convert well into 81" and shorter wheelbased Jeeps. The exception is if a V6 is used and moved forward in the engine bay. However, a V6 and TH400 is not the best combination, as 12-17% of the engine's power is consumed just to run the transmission. However, the TH400, coupled to a strong V8 in a CJ7 and longer Jeeps, is a fine choice for a conversion. If you have any questions about planning around such issues, feel free to give us a call and see if we can assist you.



Transmission Preparation

The new output shaft supplied with your #124 kit will need to be installed in the transmission before final assembly. This is usually best done by an automatic transmission professional, though several of our customers have the tools, skills, and documentation to do a successful shaft change-out. Whatever your method, this is usually a good time to check the clutches, bands, seals gaskets and filter and replace and rebuild if necessary. Recommended reading for anyone wishing to learn more about the TH400 is Ron Sessions book titled "*How to Work With and Modify the Turbo Hydra-Matic 400 Transmission*", published by MBI, ISBN 0-87938-267-8.

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 gasket off to make certain the adapter mates up easily and squarely to the TH400 case. 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 gasket ring on the adapter shoulder making sure it lays flat. You will notice that the gasket will only fit properly one way. Put a thin coat of gasket sealer (we prefer RTV Grey by Permatex™) on the rear of the transmission and the face of the adapter.

Install the aforementioned gasket on the rear of the transmission case. Reinstall the adapter and cross-tighten the bolts to 35 foot-pounds torque. It is a good practice to tighten to torque in three successive stages.



About Your Novak Adapter

The Novak #124 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 precludes the need to buy a special transfer case front output yoke. The twin-bearing design is unbeatable for strength.

Note that this adapter has been configured for your Model 18 small bore (Kit #124-3) or for your large bore Model 18 or Model 20 (Kit #124-4), 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 124-3 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 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.

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 400 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 TH400 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

On all applications, the original Jeep rear cross member, or on 1976 and newer CJ's, the skid pan; will be used. Your new adapter has a mounting pad drilled to accept the rear insulator mount normally found on the TH400 transmission. Some of these use a single, lower stud mount and these should be discarded in favor of the two-bolt style sold under Novak #RMU (urethane) or Borg-Warner #31-2268. This is attached using 3/8" bolts and nuts. Some installations will require a spacer of varying thickness, depending on the vehicle and your installation preferences. When adapting to the Model 18, space the installation such that the side mount located on the front output assembly will mount to the cross member. An insulator *must* be used there as well. 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 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.

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.

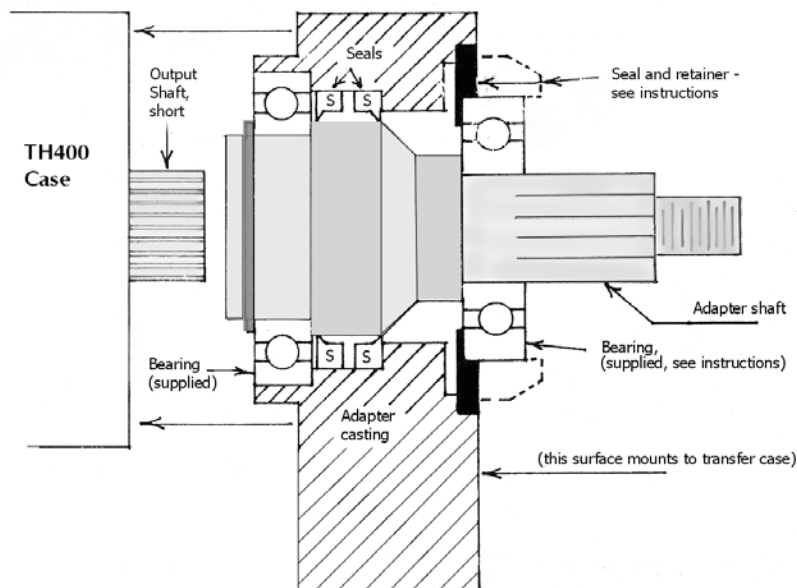
Driveshafts

For this particular conversion, shortening of the rear and lengthening of the front driveshaft will 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 1 1/4" 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 TH400 oil pan. The front of the engine must be mounted high enough to provide proper front drive shaft to starter clearance.

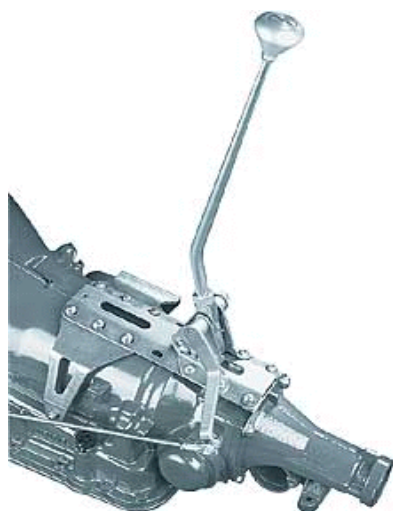
We will emphasize here that if you do not install the motor in this offset position, your front driveshaft will hit the TH400 pan. We get several calls every year from customers who have concerns about this. Invariably, they have attempted to center the motor, or they have not offset it as much as directed. 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.



The TH400 and Jeeps have quite a history together. This list is of the Jeep powertrains that had this excellent transmission. The TH400 came in 2wd or 4wd Jeeps, coupled either to the popular Model 20 transfer case or the Quadra-Trac, the latter being an option from 1973 to 1979. The early versions had factory block adapters. Later AMC versions had their own case with no adapter.

- 1965-1967, 230 I6 (Kaiser)
- 1966-1968, 327 V8 (Buick)
- 1968-1974, 232 I6 (Kaiser)
- 1969-1972, 225 V6 (Buick)
- 1969-1971, 350 V8 (Buick)
- 1971-1979, 258 I6 (AMC)
- 1971-1979, 304 V8 (AMC)
- 1971-1979, 360 V8 (AMC)



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

Some Cautionary TH400 Transmission Information

The nylon governor gear will fail from stripped teeth if the governor does not have end play. Governor end play on this transmission is controlled by the governor assembly cover and a metal pin pressed into the transmission case. This pin is pressed in from the passenger side of the transmission and its depth into the case as well as the cover gasket determine governor assembly end play.

A gasket that is too thin will usually move the governor assembly too far into the transmission, causing zero clearance between the nylon gear and the steel worm gear on the TH400 output shaft. The governor *must* have some end play or the nylon gear will be stripped. In summary, the position of the case pin and the gasket thickness determine the end play. This is not something that is normally checked. In fact, some transmission techs are unaware of the adjustment.

It is easy to check for governor gear end play before putting the adapter on the transmission. Reach in the back of the transmission with your index finger and push the governor assembly out against the cover. The nylon gear should be able to be moved back and forth in relation to the length of the transmission.

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 tunnel is configured for the manual. The look and feel of the latter shifters is often preferable.

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

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.

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 TH400 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.

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.





Novak Kit #124 includes:

- ☐ *Casting
- ☐ TH400 output shaft
- ☐ *Adapter shaft
- ☐ *Adapter bearing, front, 6210 C3
- ☐ *Adapter bearing, rear, 6307 C3
- ☐ *Locating retainer, 4" or 3-5/32"
- ☐ *Snap ring, TruArc #5160-193
- ☐ *Oil seals (2), National 6879H
- ☐ Lock nut, adapter shaft, Jeep #940970, 7/8"-16
- ☐ Washer, adapter shaft, 7/8"
- ☐ Gasket, adapter, front, #3922SL
- ☐ Gasket, adapter, rear, #8179 (4") or #8187 (3-5/32")

*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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