

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 Muncie SM420 transmission the Jeep® Spicer Models 18 & 20 transfer cases, as found in 1946 to 1979 Jeep vehicles.



JEEP POWERTRAIN SUPERIORITY

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 SM420 Transmission

The SM420, as found in ½ to 2 ton GM trucks from 1947 to 1967, reigns supreme for its low gearing and ease of converting into a Jeep. Its strength, shorter length and ease of finding make it an attractive swapping option, especially when connecting it to an early GM truck, Chevy car or Buick bellhousings. Though some state that the 420 is not easy to find, and parts are sometimes difficult to locate, we come across these transmissions often, and have noted that the parts that are not available for the 420, because of its strength, are probably not needed in most cases. Bearings, seals, small parts and synchros remain largely available.

Identification

The cast iron transmission case is identified by the bulge out the passenger side and a PTO plate on the drivers side. Later versions had two horizontal ribs cast into the passenger side of the case. Early versions had a grooved section in the neck of the input shaft for sealing purposes. Later versions used a conventional in-retainer seal. Only in the last year of the 420 did it have a reverse backup switch in the top cover. Gears two through four are synchronized with first and reverse being non-synchronized.

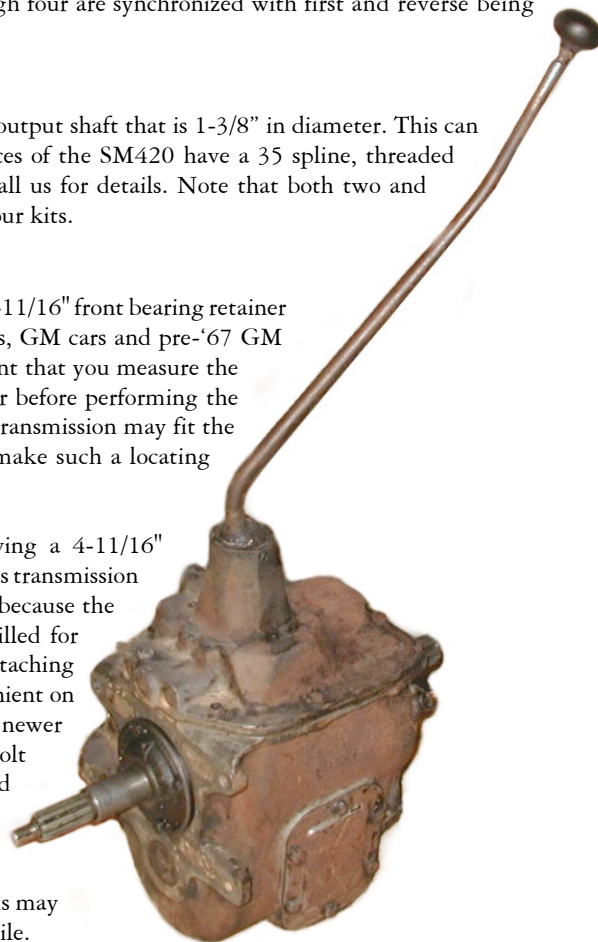
SM420 Compatibility

The correct transmission output shaft will have a 10 tooth splined output shaft that is 1-3/8" in diameter. This can be a two or four-wheel-drive transmission. Some very rare instances of the SM420 have a 35 spline, threaded output. In the unlikely event your transmission has this shaft, call us for details. Note that both two and four-wheel-drive versions of the Muncie 420 are compatible with our kits.

Joining the SM420 to GM Bellhousings

The SM420 enjoys wide compatibility with most GM engines. It's 4-11/16" front bearing retainer indexes to many GM standard shift bellhousings, including Buicks, GM cars and pre-'67 GM trucks. The latter are common donors of the SM420. It is important that you measure the locating bore on the bellhousing to confirm the 4-11/16" diameter before performing the swap. Note that it is possible to machine an indexing ring so that transmission may fit the larger 5-1/8" bore. We or a good machine shop in your area can make such a locating ring.

While the Muncie 420 can be used with any GM engine having a 4-11/16" bellhousing bore and the "regular" GM transmission bolt pattern, this transmission installs more easily with the open bottom Chevrolet bellhousings because the lower holes in the transmission case are threaded rather than drilled for clearance. The threaded hole case cannot be modified, so the lower attaching bolts must be installed from inside the bellhousing. This is inconvenient on full circle (one piece) bellhousings such as Buick V6 and 1962 and newer Chevrolet V8. The lower bellhousing holes must be drilled for bolt clearance (17/32" drill) and the clutch release arm, bearing, and bellhousing must be assembled to the transmission and then assembled as a unit to the engine. This requires that the clutch disc be perfectly aligned with the pilot bushing and that sufficient clearance exists behind the engine to install the assembly. While this may not be as convenient, it is not difficult and the results are worthwhile.



Adapting the SM420 to AMC Bellhousings

The SM420 can also be compatible with AMC bellhousings. This modification has primarily been developed for conversions replacing the SR4, T4 and T5 Jeep® transmission as used in 1980-86 CJ vehicles with a GM420 Muncie truck 4 speed.

1972-79 AMC 6 and V8 engines can also be used with this transmission but must be equipped with a bellhousing, release arm, release bearing, and clutch disc from a 1980-86 six-cylinder CJ. The 420 Muncie uses two types of lower bolt holes. One offers clearance for a bolt and the other is drilled and tapped for the bolt to screw into. Either of these types will work with this procedure.

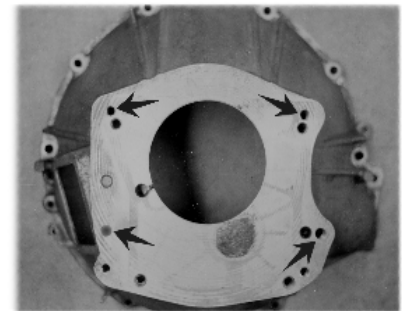
You can save some parts chasing and cost of machine work by using our #420-AMC kit as it has a modified 420 retainer, special pilot bushing and socket-head bolts. If your machinist does the work, the following section will offer him a guide. If you are using our #420-AMC kit, skip the information in the sidebar at the right about modifying the retainer and pilot bushing that follows.



Modifying the Retainer

The 420 front bearing retainer will be modified first by machining a steel bushing in a lathe to be a light press fit on the Muncie front bearing retainer tube. If using a new retainer, the dimensions of this bushing will be 1.371" inside diameter, 1.430" outside diameter, and 2.625" long. If the retainer is used, then inside dimension must be compensated for wear on the retainer when figuring the size for the press fit.

Secondly, machine a bushing ring to be pressed onto the retainer register to be a press fit to the 4.685" diameter. The outer diameter should be machined for a slip fit into the bellhousing, usually 4.850. This is a thin ring and must be made with precision.



Drill and tap new holes into the AMC bellhousing

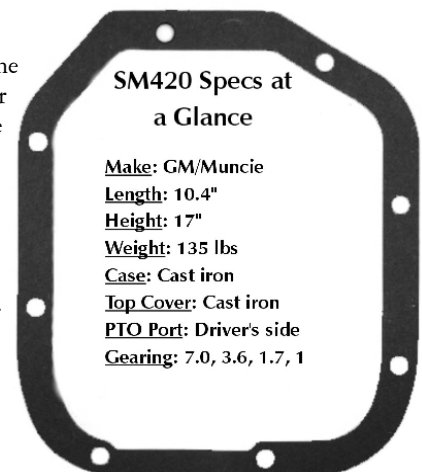
Pilot Bushing

A special pilot bushing is required and can be made as follows: Machine a piece of aluminum or steel to 1.816" outside diameter, 1.093" inside diameter and .500" long. Press a standard Chevy pilot bushing (Dorman #690-014) into this adapter and press the adapter/pilot bushing into the AMC crankshaft torque converter bore.

These components, including a new retainer, are all available direct from us as our kit #420-AMC. Buy your this from us and we'll perform the bellhousing mods for only the cost of shipping.

Install the modified retainer on the GM transmission using 5/16-18 x 7/8 socket head (Allen) bolts. Place the bellhousing on the floor, engine side down (you may have to put a couple of 2x4's or similar under it) and stand the transmission on its face on the bellhousing. In other words, just like it would be in use, only now it's standing vertically. Verify that the transmission is sitting level in relationship to the bellhousing. Transfer the mounting bolt hole pattern of the transmission to the bellhousing using a transfer punch or similar tool. Drill the two upper holes with a letter "U" or 23/64" size drill and tap these two holes 7/16-14.

If the SM420 has lower holes that are not threaded, proceed as follows: Drill the lower drivers side hole of the 420 through with a 1/2" drill. Drill the lower passenger side hole with a 27/64" drill and tap this hole 1/2-13 thread. On the lower drivers side hole, install a 7/16" bolt with the head inside the bellhousing and a nut and lockwasher at the ear of the transmission. Use a 1/2-13 bolt in the passenger side lower hole. If the 420 has lower holes that are threaded proceed as follows: Drill the lower drivers side hole through the bellhousing with a 15/32" drill. This bolt will be 7/16-14 with the head inside the housing. Drill the lower passenger side bolt with a letter U or 23/64" size drill and tap this hole 7/16-14. A 7/16-14 bolt should just pass through the lower ears on threaded type 420 transmission. If not, a few strokes with a round file will provide clearance. While these written instructions may sound complicated, the actual procedure is really quite simple and the end result is most worthwhile.



SM420 Specs at a Glance

Make: GM/Muncie
Length: 10.4"
Height: 17"
Weight: 135 lbs
Case: Cast iron
Top Cover: Cast iron
PTO Port: Driver's side
Gearing: 7.0, 3.6, 1.7, 1

Transmission Preparation

Transmission disassembly is not required to use this kit. However, the original tailhousing and yoke will need to be removed by unbolting the retaining bolt and rear driveshaft yoke (if so equipped). Remove the rear bearing cover (extension housing) and scrape the rear gasket surface of the transmission. Note that early versions of the 420 Muncie transmission had a thrust plate bolted to the end of the cluster shaft by two hex head bolts. This should not be removed, as it secures the bearing to the shaft. Your adapter has been machined for proper clearance of this bolt.

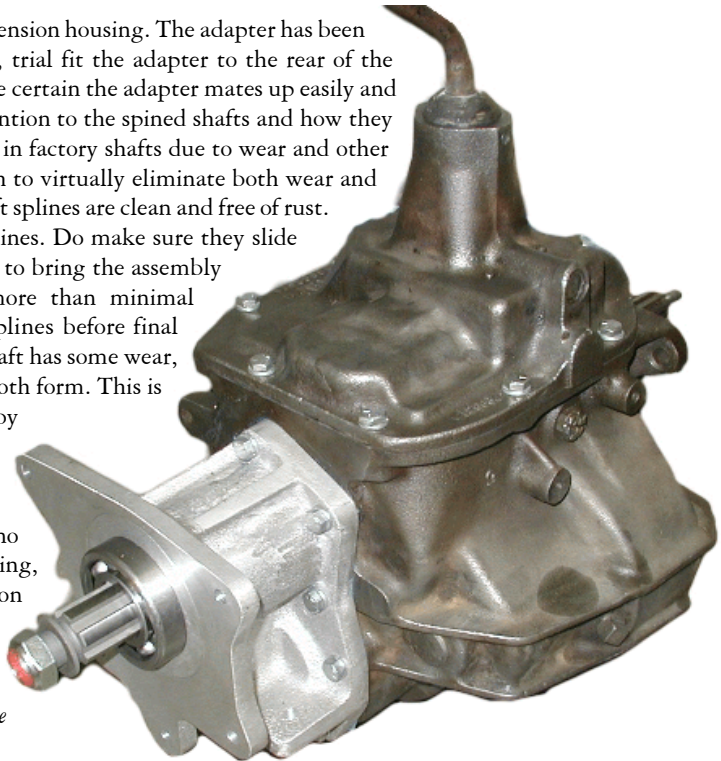
Some SM420's have a snap ring that secures the output shaft to the rear bearing, and others do not. If the transmission being used has a snap ring on the output shaft at the rear bearing, leave it in position and note that you will *not* use the supplied safety clamp ring during installation.

If you are rebuilding your SM420 transmission as part of your project, consider our SM420 Master Rebuild, kit #SPS420. It contains all of the bearings, gaskets, seals, small parts and the instruction guide as well. Feel free to contact us about any other SM420 parts needs you may have.

Adapter Installation

The adapter will replace the original Muncie extension housing. The 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 SM420 case. Pay particular attention to the spined 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 output shaft splines are clean and free of rust. You may need to polish or clean the factory splines. Do make sure they slide together 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. Note that if your particular output shaft has some wear, that the unique spline design has an involute tooth form. This is a self-centering, auto compensating spline by design and as such negates any looseness you may perceive.

Now, pay close attention here: if there was no snap ring on the output shaft at the rear bearing, then put the safety clamp ring on the transmission output shaft until it stops against the rear bearing. Tighten the clamp ring screw in the locking to 10 foot pounds. *Do not (!) use both the snap ring and the safety clamp ring. Use one or the other, but never both.*



This adapter is designed to be used with a 1/64 to 1/32" thick gasket (provided with your kit) between the transmission and adapter. If you use a gasket thicker than this, you may have excessive end play on the mainshaft and problems with the transmission staying in 4th gear. 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.

With the adapter in place, tighten the bolts while working the adapter up to the face of the transmission. Install the original rear cap bolts in the holes. Tighten all bolts to 30 to 35 foot pounds. It is a wise idea to cross tighten the bolts and in three successive steps until all are tight to torque.

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 (if applicable) is not mounted in the same offset manner that the Jeep engine was, you risk having front drive shaft clearance issues. On 1971 and older CJ models, the original 4 cylinder engine was offset 2½" towards the driver. The conversion engine and 420 trans should be shifted about 1-1/2" back towards center (not on center). *This will still leave the conversion engine and transmission offset towards the driver 1".* 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 adapter is drilled to accept the regular two-bolt rear mount used on a wide variety of GM applications. This is a Novak #RMU (urethane) or a Borg Warner part #31-2268 and will mount on the adapter using bolts, nuts and lockwashers.

Because this transmission can be used in a number of different Jeeps, the rear mounting system will differ depending on the particular installation. On early Jeeps that use a regular crossmember (as opposed to using the skid plate for a crossmember) the side mount on the transfer case would be attached first, using insulators in all cases. Then new holes are drilled in the crossmember at the location of the rear transmission mount. On these types of crossmember mountings the rear mount may require a 3/8" thick spacer between the mount and crossmember. This will vary to some extent with the condition of the transfer case side mount. Bolt holes are then drilled through the crossmember and frame at the new location. The driveshafts are then modified.

On the 1976-79 CJ's that use a skid plate for a crossmember, the spacer between the rear mount and skid plate will vary in thickness from no spacer to a 2" thick spacer depending on which set of bolt holes the skid plate is mounted to and where the engine/transmission is mounted.

Also, the skid plate may have to be notched at the front edge for clearance at the transmission case, as the SM420 hangs down lower than the original transmission. We advise the use of a flush head drain plug to minimize the size of the notch.

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.

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.

About Your Novak Adapter

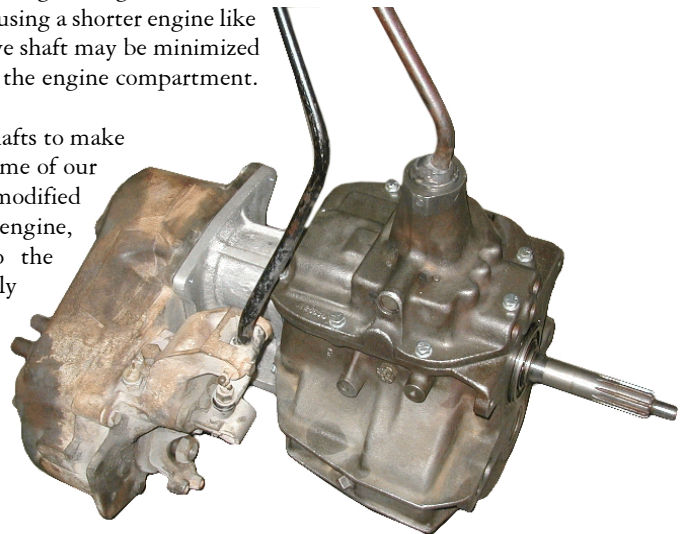
The Novak #422 adapter kit is built to high standards of design, materials and build. The adapter housing is cast of 356-T6 aluminum and is gusseted for remarkable strength. Our adapter shaft is machined of a triple-alloy gear steel, specially hardened and precision ground for strength and longevity. 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 and/or grind away the cast gussets on the side of the SM420. 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 #422-3) or for your large bore Model 18 or Model 20 (Kit #422-4), 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 422-3 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.



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.

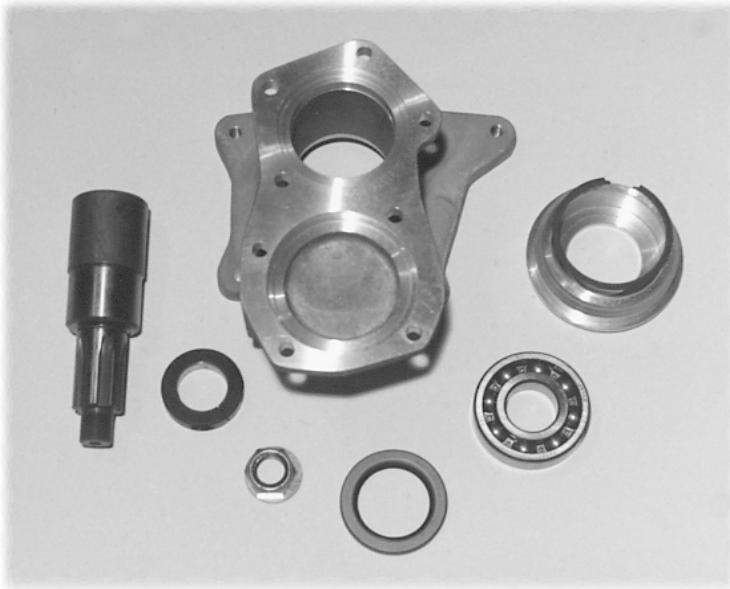
Transmission Shifter

The shifter will emerge through the floor in the standard location in most installations. The Jeep floorboard piece can be modified to clear the transmission top cover. A Hurst® (part #114-7494) or Spark-O-Matic® large boot works very well for this application.

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 SM420 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 #422 includes:

- ☐ Adapter, Novak #422
- ☐ Shaft, adapter
- ☐ Safety clamp ring
- ☐ Bearing, transfer case, #6307
- ☐ Retainer, bearing, transfer case (4" or 3-5/32")
- ☐ Snap ring (for 4" bore only)
- ☐ Seal, oil, National #472924
- ☐ Gasket, #9049
- ☐ Gasket, #8187 (small bore)
- ☐ or #8179 (large bore)
- ☐ Nut, lock, 7/8", #940970
- ☐ Washer, special, 7/8"
- ☐ Instructions

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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.

