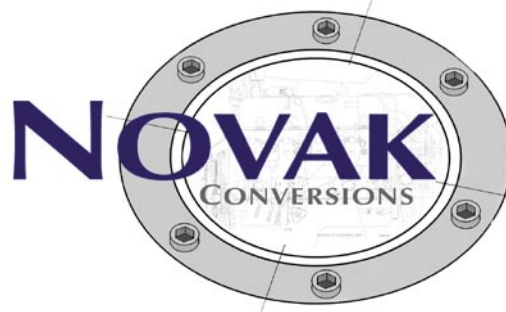


Introduction

We hope that the adaptation of your NP435 goes well and that you achieve professional quality results from your work.

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 rebuilds, both in our own facility and information we've gained from discussing this swap with our customers. Put this information to good use.



JEEP POWERTRAIN SUPERIORITY

About the NP435 Transmission

The NP435 was made by New Process Gear from 1964 to 1993. They are found in GM trucks until 1972, Ford trucks until 1992 and Dodge trucks until 1993. The 435 is an excellent heavy-duty truck transmission designed and used in 1/2, 3/4 and 1-ton trucks. Only the Ford (two and four-wheel drive) and Dodge versions are compatible with our conversions.

This transmission makes an excellent conversion transmission due to its adaptability into many Jeeps. Because of its configuration, the right versions of the NP435 can be adapted to Ford, GM, AMC and Dodge bellhousings.

Identification

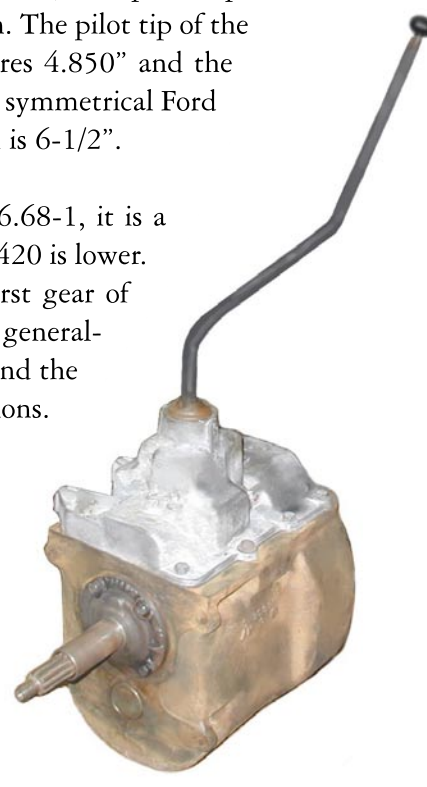
This transmission is 10.8" long and features an aluminum top cover that is retained by eight bolts. The NP435 case is of cast iron. There are two and four-wheel-drive models, the critical difference being in the bolt pattern of the rear housing. The Ford NP435 has a 1-1/16" diameter, ten spline input shaft that has a stickout of 6-1/2" from the front face of the transmission. The pilot tip of the transmission measures .668". The front bearing retainer flange measures 4.850" and the bearing retainer tube is 1.432" in diameter. The front bolt pattern is the symmetrical Ford "butterfly" pattern; 8-1/2" wide by 6-5/16" tall. The input shaft length is 6-1/2".

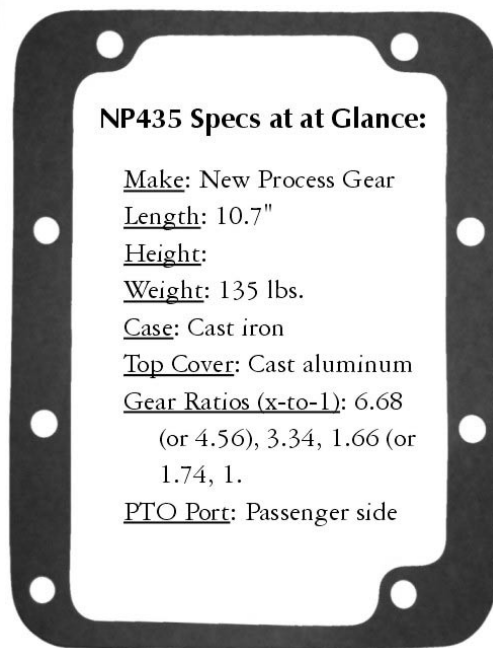
The NP435 enjoys the advantage of lower gearing than the T18. At 6.68-1, it is a popular choice for those wanting a very low crawling gear. Only the SM420 is lower. Note that some Dodge versions of this transmission offered a taller first gear of 4.56-to-1. It is a well built transmission and remains quite common and generally inexpensive to buy and maintain. The strength, relatively short size and the gearing of the transmission make it a good choice for a variety of situations.

Compatibility

The adapters we make for this transmission are for both the two-wheel-drive and four-wheel-drive versions. Note that Ford four-wheel-drive trucks with the remote (or divorced) mounted transfer case have the two-wheel-drive bolt pattern on the rear face.

Many of these Ford NP435's have two extra undrilled ears cast into the front face of the transmission case. This is not crucial when fitting the transmission to a Ford or some AMC style bellhousings, but is





NP435 Specs at at Glance:

Make: New Process Gear

Length: 10.7"

Height:

Weight: 135 lbs.

Case: Cast iron

Top Cover: Cast aluminum

Gear Ratios (x-to-1): 6.68

(or 4.56), 3.34, 1.66 (or
1.74, 1.

PTO Port: Passenger side

important if you intend to run it behind a GM bellhousing using our "adapter-free" method. The transmission having these extra undrilled ears will greatly simplify its use with GM engines (see, Adapting Ford Transmissions to GM Bell housings at the Novak website). One excellent feature of the NP435 is that they are readily compatible with Jeep/AMC T150, T18 and T176 style bell housings, common from 1976 to 1986. See Adapting Ford Transmissions to AMC Bell housings at the Novak website for details.

Dodge NP435's have a unique front bolt pattern and input shaft configuration. They do not interchange with the

Ford style units and are only useable against the appropriate Mopar bellhousing.

A Cautionary Issue on Towing

Improperly towing any vehicle with the NP435 transmission will cause the very prompt destruction of third gear bore and the mainshaft journal due to insufficient oiling.

If you must flat tow, and have a transfer case, you may set it in full neutral and place the NP435 in any gear to prevent mainshaft spin. However, note that many transfer cases themselves do not allow for flat towing.

Preferably, you may wish to disconnect the rear drive shaft. Rear axle lockout hubs may be a worthwhile addition for this reason.

We have seen and heard of a few incidents of this over the years, the worst of which producing a complete friction welding of third gear to its mainshaft.

This is one of the only quirks of the 435, and easily avoidable.

The Conversion Procedure

Installing the Pilot Bushing

Before installing the transmission to the engine, the special pilot bushing provided (if applicable) must be installed in the AMC or GM crankshaft. A piece of broomstick makes a good drift punch to install the pilot bushing. Never hammer directly on the bushing as it is quite soft, and it will surely be damaged by such a technique. If the tolerances are tight between the crank and bushing, you may wish to set the pilot bushing in the freezer for an hour and then very lightly warm the end of the crank with a torch before assembly. This facilitates some installations and provides for a secure fit.

About Your Novak Adapter

The Novak #431 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.

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.

Adapting the Ford NP435 to an AMC Engine

The 1966 and new Ford T18 four-speed can be used with 1972 and new AMC I6 or V8 engines using AMC parts. Three AMC bell housings will accept the the transmission, two as a direct bolt-up. These two are from a 1976 to 1979 CJ (I6 or V8; three-speed or four-speed) or a bellhousing from a 1980 to 1983 CJ that was factory equipped with a Tremec 170 series four-speed. A third bellhousing can be modified to work by drilling and tapping the Ford pattern into it. This bellhousing is from a 1980 to 1986 CJ that originally had an SR4, T4 or T5 transmission. The clutch release fork and release bearing from any of these three housings must also be used.

A 1976 to 1979 Jeep CJ clutch disc will match the Ford input spline. A special pilot bushing will be required to compensate for the slightly shorter length of the Ford transmission input shaft. This bushing is provided with our adapter kit if indicated.

Note that the 4.0L engine has the same block pattern as the 258's found with the above bell housings. However, these bell housings will require a provision for the Crank Position Sensor unless you are relocating this function to the front of the crank. Novak has developed a way to precision drill and bore a

port into your AMC style bellhousing for the 4.0 CPS.

Clutch System

The clutch is not so much dependant on the transmission being used as is the engine, but a general guideline is to use the flywheel and pressure plate as prescribed for your year and model of engine. The clutch disc must have a 1-1/16" x 10 spline hub to match the Ford input shaft. These come

in both the Jeep (1976-1979) versions and most Ford applications.

You should retain your hydraulic master cylinder and then use a slave setup like the original Jeep version (with the exception of the integrated internal hydraulic release bearings) that use an external slave and pivoting release arm. A more in-depth discussion can be had at the Novak Knowledge Base, www.novak-adapt.com, or with a tech at Novak who may also be able to configure a clutch system that is most appropriate for your combination.



Transmission to Transfer Case Conversion Procedure

The installer has the discretion to just install the mainshaft as part of the conversion, or, do a complete rebuild if necessary or desired. As such, we will describe the entire rebuild procedure below and the reader can choose the relevant sections according to the depth of work being performed.

Introduction to Rebuilding

The NP435 is a great transmission, and often a pleasure to rebuild. Their design lends them to servicability, making it a good rebuild choice for the first-timer.

Remember throughout your installation/rebuild, that you are dealing with hardened metals in this transmission. Hammering, pressing or shocking any surface with any tool that is not significantly softer than the steel being serviced will chip or break parts. Always use brass, aluminum or wood drifts to drive parts. Do not use screwdrivers alone to pry off snap rings.

The three tools that transmission disassembly requires that may not be in your tool chest already are:

- 1) Heavy duty external snap ring pliers
- 2) Bearing puller/splitter set
- 3) Hydraulic shop press and various arbors/sleeves

These tools can be rented, borrowed or even purchased for prices that should not be too shocking.

The first step in any proper rebuild is the degreasing and pressure washing of the transmission. As dirt and particles are capable of



This style of snap ring plier is more universal, with a dimpled and knurled flats. They are great for smaller snap rings.



Above: Tools common to a gearbox rebuild.

Bearing and gear pullers will vary.

Below: A set of large, bevel tipped, external snap ring pliers is indispensable for removing the large Eaton type retaining rings you'll encounter. These shown are under the Blue Point brand.

wrecking any transmission in a short period of time, you should take every precaution. A clean transmission and work area also makes the rebuild a more enjoyable experience.

We are often asked our preference of RTV for gaskets during reassembly. We prefer RTV Gray by Permatex™. It is a slightly stiffer compound and makes for an oil-tight transmission. Always use RTV sparingly, as any breakaway piece could go rogue in your transmission and plug an oil passage, to your transmission's demise.

While small parts and bearings can occasionally be reused, we recommend replacement of them. Your transmission will run quieter, longer and more durably with new bearings. This is especially important if you are replacing your mainshaft with a Novak conversion shaft. Our premium case-hardened gear steel and precision ground surfaces deserve new, quality bearings. Your 435 will run smoother than ever.

Transmission Disassembly

Shift Cover Removal

First, shift the transmission into neutral. Remove the transmission shifter stick by pressing downward and rotating counter-clockwise the domed bezel. If the shifter is detached already, you may use a large screw driver to pry the actuators into the neutral position. The slots will be lined up with each other if it is in neutral. The bezel will release and allow the shifter to be removed. Remove the top cover bolts (x 8). Note that there is one bolt per side that is shouldered. These are used for cover alignment upon reinstallation. Remove the top cover while rotating it slightly counterclockwise to allow the shift forks to clear the internals while you pull the top cover assembly away. It may require a few light blows with a soft-faced mallet to break the gasket's hold. If you must pry with a screwdriver, keep it out towards the edge so as not to mar the gasket sealing surfaces.

Main Gearbox Disassembly

Now, put the transmission in two gears (i.e., first and fourth, by pulling the first gear slider rearward and engaging fourth gear via the third-fourth synchro/shifter forward). This will lock the mainshaft. If you are working with a two-wheel-drive version of this transmission, you will now remove the rear yoke and parking brake assembly (if equipped). The rear lock nut is removed by using a crescent wrench or large socket. You may wish to counter rotate the drive yoke with a pipe wrench or other large adjustable wrench. Remove the four rear bolts on the adapter or the tail housing and pull the assembly back away from the transmission. This will expose the rear bearing and snap ring. Next, remove the front bearing retainer from the case by removing its 5/16" bolts.

Now, tap the transmission input shaft rearward with a brass, aluminum or wood drift. This will dislodge the rear bearing slightly. Using a pair of suitable snap ring pliers, remove the snap ring from the rear bearing. Attach a proper gear or bearing puller to the bearing and pull it rearward against the tip of the output shaft.

Move back to the front retainer. With these bearings removed, you can now move the mainshaft assembly towards the rear of the case while tilting the input shaft upward. The shafts will separate at the pilot. Pay attention to the main shaft pilot roller bearings, as they will keep you busy finding them if they fall out of the rear bore of the input shaft.

Remove the main shaft as an assembly and set it on a clean surface for inspection. The input shaft may be removed now as well.

Input Shaft Disassembly

Using a small screwdriver and a tiny punch, remove the snap ring that retains the needle rollers in the rear bore of the input gear. Note here that there are two styles of input bearings. Early transmissions use a conventional ball roller & race type bearing. Later and far more common versions use a tapered roller and cup assembly. Use whichever method is appropriate to remove the front bearing.



Removing the tapered cup from the retainer is less simple than it should be. We're not entirely sure what NP engineers had in mind here for the replacement of this cup. A discussion with some of the pros in the rebuilding business yielded their stated preference of just buying a new retainer. However, we have successfully removed the cup by milling a full slot into it with a four-fluted carbide end mill, thus releasing it from the retainer bore.

It may be possible to get under the cup with a special miniature prybar, though these are unique tools and it would still be a difficult task.

Mainshaft Disassembly

Disassembly of the main shaft assembly is as follows: Remove the rear spacer (#52). Slide the first sliding gear off of the back of the mainshaft. Note here that you should place all mainshaft components on a clean surface in the order and orientation that they came off the shaft. This is an especially helpful organization technique for rebuilders, experienced or not.

The great majority of NP435's have a Torrington flat thrust bearing assembly between the input gear and the 3rd gear synchronizer hub gear. Early and rare instances use a snap ring at this location. Remove either the snap ring or bearing now, followed by the synchronizer assembly. Third gear will now slide off easily.



Now, remove the second gear snap ring. This is a unique split-type snap ring (image, adjacent). A screwdriver in one notch in the ring will release it with a light pry (image). Slide second gear off of the shaft. Set the bare mainshaft aside.

At this point you should determine if you are going to do a complete rebuild, or if you are going to stop at the upper end. Most prefer to fully rebuild, or at least, thoroughly inspect all the components of the transmission. Once you are in to the transmission this deep, the full rebuild is a relatively minor affair.

Reverse Idler Gear Disassembly

Since the reverse idler gear is bathed in oil and used to a far lower degree than the remainder of the gears in the transmission, it is uncommon that it requires service. However, if the transmission has seen neglect, or it shows signs of inordinate wear, you will want to service it. To do so, undo the reverse idler lock plate to free the shaft. Remove the reverse idler snap rings at either end of the shaft. Remove the first needle bearing roller thrust washer, needle rollers, inner race and spacers from the idler gear.

Countershaft Removal

The NP435 countershaft removes easily as such: Remove the counter shaft rear main bearing by unbolting its rear cap. Now, move the countershaft rearward. The gear will stick through the case. You can then tilt the front of the assembly upward and pull it out of the case. You can tap the front Torrington roller out of the case with a drift and hammer.

Inspection

Inspect all parts for discoloration, warpage, brinelling, breakage and wear. We get several questions as to whether gears should be replaced if nicked or otherwise damaged. As a general rule, if the lead-in portion of the gear tooth can be reasonably smoothed back to its proper shape with a stone or fine file, it can usually be reused. Gear breakage, excessive rust (pitting) and other damage that extends to the pressure faces of the gear teeth themselves are grounds for replacement. Should you need such components, call us. We keep on hand (or can quickly special order) any NP435 parts, new and used.

The Third-Fourth Synchro

Let's cover the third-to-fourth synchronizer assembly. There are essentially two designs. One uses separate components, allowing the synchro rings to be serviced individually. These are the most common and our basic rebuild kit is configured for these by default. There is a second design that uses a bonded assembly which cannot be taken apart, except for the hub and the steel drive plates. If you have this version, you will need to buy a synchro assembly, trading the individual synchros that came in your master rebuild kit towards the assembly. This is a ~\$30. upgrade (part #AWT275-2.5B) with which you will keep your drive plates and existing hub (as they are negligible wear items), and receive the superior separating rings design.

Don't hesitate to contact us with any questions at all about this and more detailed options if necessary.



Detent springs should be checked for collapse or damage.

Reassembly

During the assembly process, be sure to grease all the components and their mating parts. This is crucial during initial spin of the rebuild. Be especially generous with coating third gear and its journal.

Install the new Torrington bearing in the lower front of the transmission case. This can be driven in with a mallet. Use a block of wood or aluminum to keep it going in square and to protect the shape of the bearing. Note the orientation of the 1/8" oil port in the outer race. This should face the cutout portion of the case. Follow up by tapping the cap in.

Insert the counter shaft as it was removed. Replace the countershaft rear bearings (both side and thrust rollers) next, followed by the replacement of the cap gasket (use RTV). Next, reassemble the reverse idler assembly in the same manner it was disassembled.

Mainshaft Assembly

Start the mainshaft assembly process by replacing the second gear synchro. This is easily changed out by releasing the spring. From the three slotted pins. Assemble the second gear synchro spring and brake. Note that the bent tangs on the lock ring are to face away from the gear (see image, right). Slide second gear onto the shaft with the synchro brake facing rearward. Now install the special two-piece snap ring. A gloved hand can often do this. Otherwise, a large pair of channel lock pliers may help.

Install third gear, followed by the synchro assembly adjusting shims. These are stamped with a toothed profile on the inside diameter. Our small parts kits for these transmissions come with these shims and you should also keep the originals on hand as well to keep your options open. Following this is the third-to-fourth synchronizer hub onto the fine splined section of the front of the mainshaft. After this, you will install the Torrington face/thrust style bearing assembly.

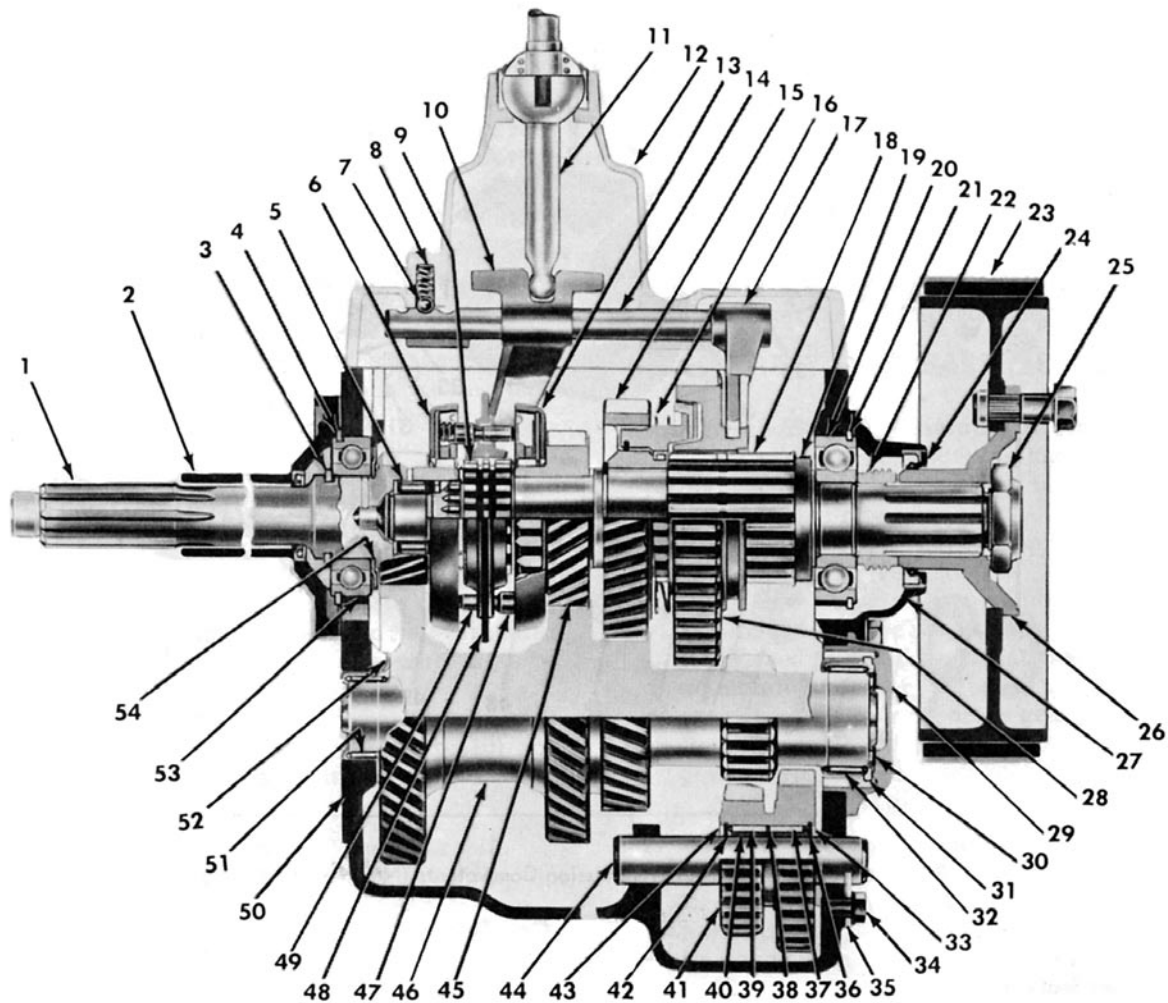
Install the synchro assembly now onto the drive hub. Move to the back of the shaft and slide the first/reverse sliding gear on the shaft, with the shifter groove rearward. At this point you have an option. You may reinstall the two anti-rattle

springs in the special width splines of the first gear (image, right). However, we spline our shafts more precisely than New Venture and as such,

Notes on the NP435's First Gear Detent
Some 435's show a tendency to walk out of first gear. This is due to a shallow detent notch in the shift rail. It was designed as such presumably to ease the shift from first to second gear while pulling a load, so as to not lose the forward momentum of the truck. However, as Jeeps spend considerable time in first while crawling, it is advisable that the detent notch be ground to match the other notches in the rails. Don't overdo it. If you wish, you may also install a heavier or slightly longer spring in place of the original.



NP435 Cutaway View (earlier ball bearing input version)



Legend

- | | |
|---|---|
| 1. Main Drive (Clutch) Gear | 29. Countershaft Rear Bearing Retainer |
| 2. Drive Gear Bearing Retainer | 30. Thrust Bearing Race |
| 3. Snap Ring (Selective) | 31. Countershaft Rear Thrust Bearing |
| 4. Snap Ring | 32. Countershaft Rear Searing Assy. |
| 5. Needle Bearing Rollers (14) | 33. Snap Ring |
| 6. 4th Speed Synchronizer Outer Stop Ring | 34. Lock Plate Retaining Screw |
| 7. Poppet Ball | 35. Lock Plate |
| 8. Poppet Spring | 36. Roller Retaining Washer |
| 9. 3rd and 4th Speed Synchronizer Clutch Gear | 37. Needle Bearing Rollers (34) |
| 10. 3rd & 4th Shift Fork | 38. Bearing Roller Separator |
| 11. Gearshift Lever | 39. Needle Bearing Rollers (34) |
| 12. Transmission Cover | 40. Needle Bearing Roller Inner Race |
| 13. 3rd Speed Synchronizer Outer Stop Ring | 41. Reverse Idler Gear |
| 14. Shift Rail | 42. Roller Retaining Washer |
| 15. 2nd Speed Gear | 43. Snap Ring |
| 16. 2nd Speed Synchronizer Spring | 44. Reverse Idler Gear Shaft |
| 17. 1st & 2nd Shift Fork | 45. Mainshaft 3rd Speed Gear |
| 18. Mainshaft | 46. Countershaft and Gear C luster |
| 19. Mainshaft Rear Spacer | 47. 3rd Speed Synchronizer Inner Ring & Pin Assy. |
| 20. Mainshaft Rear Bearing Assy. | 48. 3rd and 4th Speed Synchronizer Sliding Clutch |
| 21. Snap Ring | 49. 4th Speed Synchronizer Inner Ring & Pin Assy. |
| 22. Speedometer Drive Gear | 50. Transmission Case |
| 23. Parking Brake Assy. | 51. Countershaft Front Bearing Assy. |
| 24. Mainshaft Rear Oil Seal | 52. Thrust Washer |
| 25. Yoke Retaining Nut | 53. Main Drive Gear Front Bearing |
| 26. Output Yoke | 54. Oil Slinger |
| 27. Mainshaft Rear Hearing Retainer | |
| 28. Mainshaft 1st Speed Sliding Gear | |

we've eliminated the requirement for them. Our shafts will not allow the gear to rattle. We recommend you leave the springs off for ease of assembly. If you do install them, use a grease to aid you in holding the springs until the gear is securely installed. Make sure the gear slides easily, but is not loose. Note that the spline roots will smooth to the gear over a short period of shifting use.

Mainshaft Installation

The shaft and gears assembly is now ready to be installed into the transmission. Point the tail in first and position the shaft and



gears. Install the mainshaft rear spacer (#52). Next, install the rear bearing onto the shaft journal. A press may be helpful here, but you can also use a steel sleeve tool that has a diameter just larger than the shaft journal. Place a block of wood between the inner case front and the mainshaft pilot tip. Either press the bearing on, or drive it on with the sleeve and a mallet. A dab of grease always makes this an easier process.



Make sure all gears slide or spin easily and that all snap rings are secure. Note the following: if you are using Novak kit #432, adapting the NP435 to the Models 18 & 20 transfer cases; the new main shaft will be installed in the transmission in the same manner as the original Ford shaft except that the retainer ring on the outside of the rear transmission bearing

will be used, but the one that safetied the shaft to the bearing will not be used. This inner ring is replaced by the transfer case input bearing and retainer. However, if you are using Novak kits #433 or #431, adapting the NP435 to the Model 300 or 231 transfer cases, be sure to install the rear bearing snap ring from the Ford shaft.



Input Shaft Assembly & Installation

Press the new roller bearing onto the input shaft journal. If it is tapered, the small diameter of the bearing will face forward. Press the bearing cup into the retainer in like orientation with a press and a plate of similar diameter. Or, you may use the old bearing as a press arbor. You may also use a brass or aluminum drift rod and a hammer and walk it around the perimeter. Careful not to get it in crooked at all.

Install the roller bearings into the input gear bore with a sticky assembly lube or petroleum jelly. Follow this with the installation of the new snap ring. Insert the input shaft assembly into the transmission, being careful not to upset the free rollers as you engage the



pilot tip of the mainshaft.

Now, place the input bearing retainer in place with one gasket (no RTV just yet) and torque the 5/16" bolts to 15/19 ft. lbs (oiled/dry).

Adapter Installation

The adapter will now be installed with the following notations: First, lube the adapter seal and transfer case input shaft before installing adapter. This adapter is machined to a median of factory specifications and is designed to be used with a 1/64 to 1/32" thick gasket between the transmission and adapter, as supplied. Note that gasket thicknesses from varying manufacturers vary, as will your endplay when using them.

With the housing in place, tighten the nuts while working the adapter up to the face of the transmission. It is a wise idea to cross tighten the bolts and in three successive steps until all are tight. Do not use the bolts to press the housing into place! If it does not slide easily into place, find and diagnose the source of the bind before tightening the bolts. Torque the bolts to 35/45 ft. lbs (oiled/dry).

Transfer Case Installation

231 Input Gears and Compatibility

The important variations to look for in this transfer case when planning a conversion lie in the input gear. It comes in 21 spline and 23 spline versions with long, medium (rare) and short variations.

	21 Spline	23 Spline
Short Input	AW4 (through 1990) AX4 AX5	Earlier (pre-'95) AX15 AW4 (post-'90)
Long Input	Peugeot BA 10/5	Peugeot BA 10/5 Later (post-'94) AX15 TF904 TF999
Medium Input		Jeep ZJ's '93 to '95 only

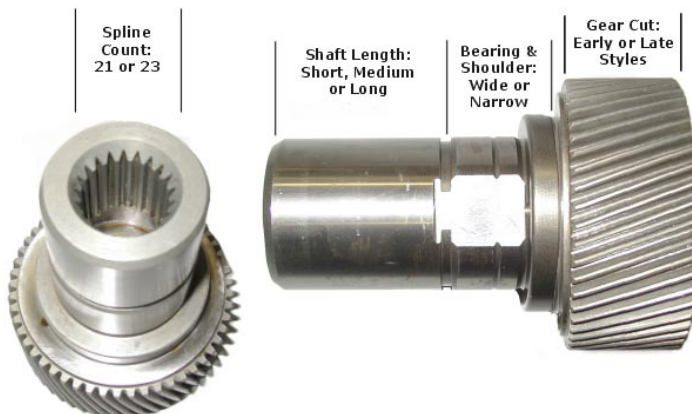
The long shafts protrude 2.1" from the front mounting face of the transfer case. The short version protrudes 1.2". The rare medium shafts protrude 1.7". You should be careful when swapping any of these gears due to different bearing widths and gear teeth. The following chart shows how to determine which input gear you should have by transmission. It is always good to verify first hand if possible.

Because of differences in the cut of the gear, as a general rule; one should not interchange pre-'95 gears with post-'94 gears. These years are not hard and fast delineations. If one is not absolutely certain, disassembly and inspection is required.

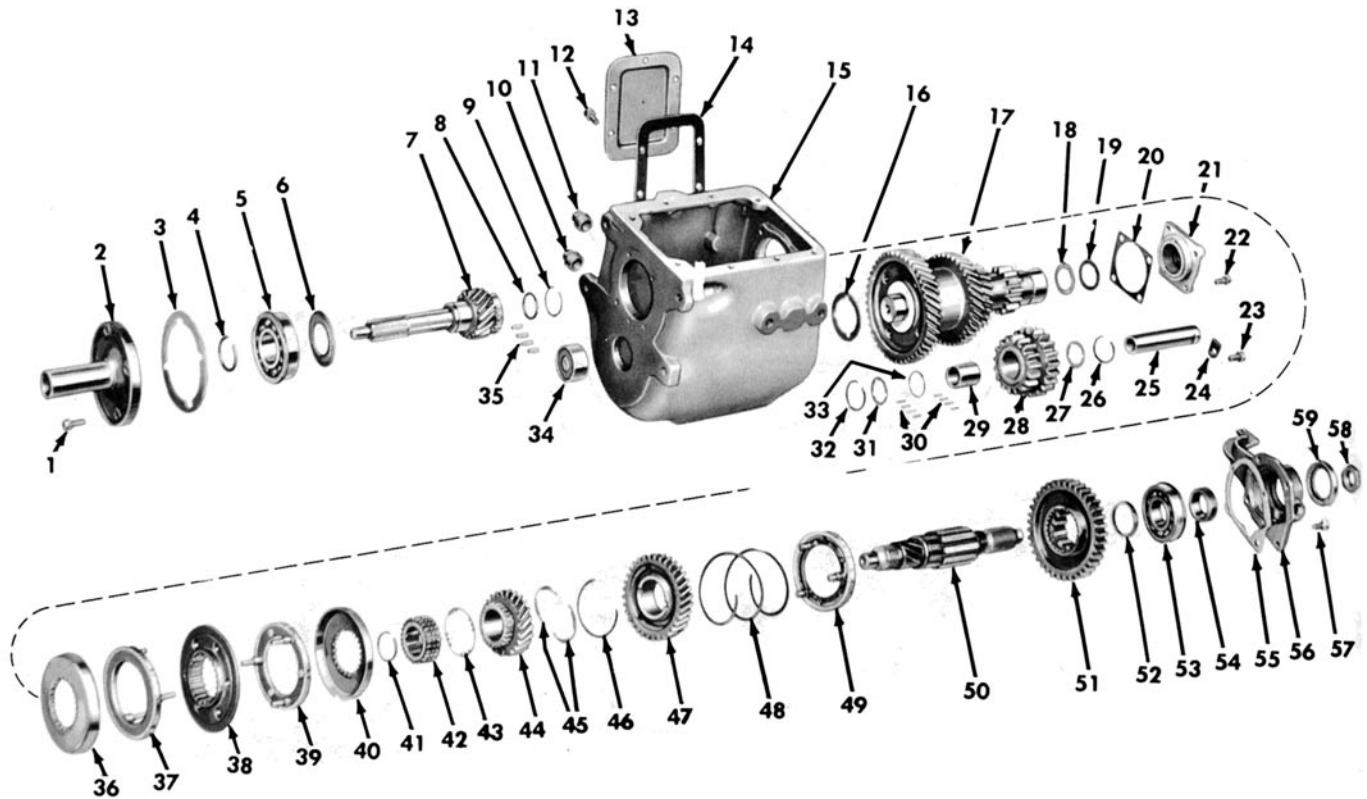
Note that some transmissions change spline count. The AW4 had 21 splines through 1990. In 1991, the same year the 4.0 HO was introduced, the AW4 splines increased to 23.



Installing the rollers into the input shaft bore.



NP435 Exploded View



Legend

- | | | | |
|-----|---|-----|---|
| 1. | Screw and Lock Washer Assy. | 31. | Needle Bearing Roller Retaining Washer |
| 2. | Main Drive Gear Hearing Retainer and Oil Seal | 32. | Snap Ring |
| 3. | Gasket | 33. | Needle Bearing Roller Separator |
| 4. | Drive Gear Searing Retainer Snap Ring (Selective) | 34. | Countershaft Front Bearing |
| 5. | Main Drive Gear Front Hearing | 35. | Pilot Bearing Rollers (14) |
| 6. | Drive Gear Bearing Oil Slinger | 36. | 4th Speed Synchronizer Outer Stop Ring |
| 7. | Main Drive Gear | 37. | 4th Speed Synchronizer Inner Ring and Pin Assy. |
| 8. | Retaining Washer | 38. | Synchronizer Sliding Clutch |
| 9. | Snap Ring | 39. | 3rd Speed Synchronizer Inner Ring & Pin Assy. |
| 10. | Drain Plug | 40. | 3rd Speed Synchronizer Outer Stop Ring |
| 11. | Filler Plug | 41. | Snap Ring (Thrust Bearing in Later Versions) |
| 12. | Screw and Lock Washer Assy. | 42. | 3rd & 4th Speed Synchronize Clutch Gear |
| 13. | Power Take-off Cover | 43. | Adjusting Shim |
| 14. | Gasket | 44. | Mainshaft 3rd Speed Gear |
| 15. | Transmission Case | 45. | Mainshaft 2nd Speed Gear Split Ring (2 Halves) |
| 16. | Thrust Washer | 46. | Snap Ring |
| 17. | Countershaft and Cluster Gear | 47. | Mainshaft 2nd Speed Gear |
| 18. | Thrust Bearing | 48. | Synchronizer Spring |
| 19. | Bearing Race | 49. | Inner Stop and Clutch Pin Ring Assy. |
| 20. | Gasket | 50. | Mainshaft |
| 21. | Countershaft Rear Bearing Retainer | 51. | Mainshaft 1st Speed and Reverse Sliding Gear |
| 22. | Screw and Lock Washer Assy. | 52. | Mainshaft Rear Spacer |
| 23. | Screw and Lock Washer Assy. | 53. | Mainshaft Rear Hearing |
| 24. | Reverse Idler Gear Shaft Lock Plate | 54. | Speedometer Drive Gear |
| 25. | Reverse Idler Gear Shaft | 55. | Gasket |
| 26. | Snap Ring | 56. | Mainshaft Rear Bearing Retainer |
| 27. | Needle Bearing Roller Retaining Washer | 57. | Screw and Lock Washer Assy. |
| 28. | Reverse Idler Gear | 58. | Mainshaft Nut |
| 29. | Needle Bearing Roller Inner Race | 59. | Mainshaft Rear Bearing Oil Seal |
| 30. | Reverse Idler Gear Needle Hearing Rollers (68) | | |

We work closely with our customers, and our website assists them in making an informed decision about which adapter kit to buy in terms of spline count and input gear length. It is possible that not every variation that Jeep has will not match the documentation available. Check these features early in the process, noting that your adaptation will require a seal spacer sleeve if you have the short version of the input gear. This ensures that the actual adapter seal reaches the transfer case seal journal. If installing our spacer sleeve, lay a light fillet of RTV into the machined shoulder of the spacer where it meets the adapter seal bore. Gently press or drive this part into place.

Wire brush your transfer case input gear splines if necessary. Grease your transmission shaft output splines and transfer case input splines with a heavy black or synthetic grease. This adds to the life and long-term longevity of the hardened spline faces that transfer so much power through your drivetrain. Trial fit the transfer case. It should slip readily into place.

Bolt Up the 231 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. As such, match the aluminum face of the adapter to the transfer case front face. You may wish to lightly face any marks or debris from the 231 transfer case input face with a fine abrasive paper. The aluminum faces will conform to each other and provide a dustless cavity, though you are free to apply a thin bead of RTV to this face if you wish.

Install the transfer case with 3/8" bolts or studs (studs may be easier) and lockwashers. 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 that 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.

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. This mount will sit directly under the adapter, for which a cast-in pad and drilled holes are available. There are only rare instances where the base of your adapter need be modified.

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 achieve 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.

Transmission Shifter



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.

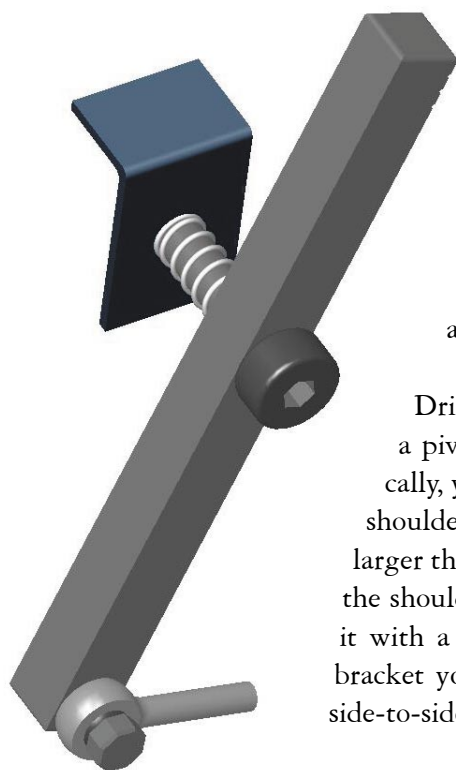
Because of varying engine positions and different shifter stick configurations, you will likely need to bend your NP435 shifter to match your Jeep's tunnel and your own ergonomics. Removal of the stick is easily done by pressing down and rotating the sprung hold down bezel surrounding the base of the shifter. You can then remove the shifter from the housing and heat it to achieve the proper bends. Follow up with a light sanding and a coat of enamel.

Transfer Case Shifter and Linkages

The OEM 231 transfer case shifter assembly can be difficult to work with, and we recommend that you simplify this. There are four known different versions of these shifters, adding to the variation. The installer can make a very useful shifter assembly with the use of standard,

on-the-shelf materials and components. Getting rid of the dummy-proof gated shifter plate is appropriate for an individual clever enough to do a transmission swap. We have found that the TJ versions of these shifters are a little easier to retain than their YJ predecessors, as they mount to the body and have a simple rod actuation system.

One suggestion is to drop an angle bracket off the side of the transmission as an anchor point. Use of two of the top cover bolts is excellent for this. You may also use two of the adapter bolts in some situations. The bracket should be rigid enough to handle the leverage the shifter generates. Use of a steel or aluminum rod (square or rectangular) for a new shifter lever is recommended.



Drill a hole through the rod that will be used as a pivot. Use a shoulder bolt as a pivot point. Typically, you will use a shoulder bolt with a 1/2" diameter shoulder. Your drill hole through the rod will be just larger than this for easy insertion, but not too loose. Run the shoulder bolt through the hole in the rod and secure it with a nut and lock washer on the inner side of the bracket you've made. A spring on the side will set your side-to-side distance and offer rigidity to the lever.

Driveshafts

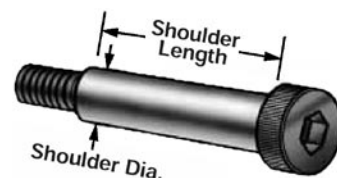
Most factory transmission and adapter combinations to the Jeep transfer case vary. As such, it is often that driveshaft lengths will need to be changed to accommodate the swap. Also, consider that there are multiple ways to install a conversion engine (often used with this transmission) and the following 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. Our experience has shown that some stock Jeep drive shafts are not quite the correct length

Shackle Reversal Caveats

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.



A shoulder bolt makes for a perfect pivot. They are commonly available through industrial and fastener suppliers.

from the factory to begin with. This can be corrected if the drive-shafts are modified.

Check Your Tolerances

As stated earlier, there are two different styles of NP435's. The earlier and rarer GM & Dodge versions used a ball roller as the front main bearing. The latter and very most common version uses a tapered roller and cup assembly. This version is unique from other truck transmissions in that the input and output shaft endplay are dependent on each other, as there is a thrust bearing between the third/fourth gear synchro hub and the rear face of the input gear.

Mainshaft & Input Shaft Endplay

You should now check for end play of the main shaft assembly. This is done by installing the rear gasket (without RTV at this point), and the adapter and then placing a dial indicator at the tail of the shaft. Firmly tug and push the shaft while reading the indicator. You can also tap the input/output shaft ends with a dead blow (soft) hammer. End play should be between .001" and .005". If the end play falls out of this range, you must add what are called "selective gaskets" to the front input retainer. Once you are satisfied with the result, move on to the final assembly steps.

In the rare event your input bearing style is the ball roller version, you will install a snap ring onto the third-fourth synchro assembly hub journal of the mainshaft. Your endplay can be from .004" to .009" in both input and output shafts.

Synchro Assembly Endplay

Just like brake shoes need a margin of stand-off from their mating surface, so do synchro rings. The specified amount of play in the assembly is broad; between .050" and .070". This is most easily checked by using

a feeler gauge assembly and stacking the feelers as appropriate. They will force the plates and assembly to tighten as you insert them between third gear and the rear synchro drive plate - until you can no longer add any more feelers. Adjust this number if necessary by adding or removing the internally toothed steel shims discussed earlier.



Seal it Up

Once satisfied with your transmissions operation, remove the tailhousing and the front input retainer. Use RTV silicone (we like Permatex® Gray) in thin layers on each side of each of the transmission gaskets. Install the bolts and torque them lightly until the silicone just begins to squeeze out. Return and tighten the bolts to final spec (in an incremental crossing pattern) in a few hours after the sealant has solidified.

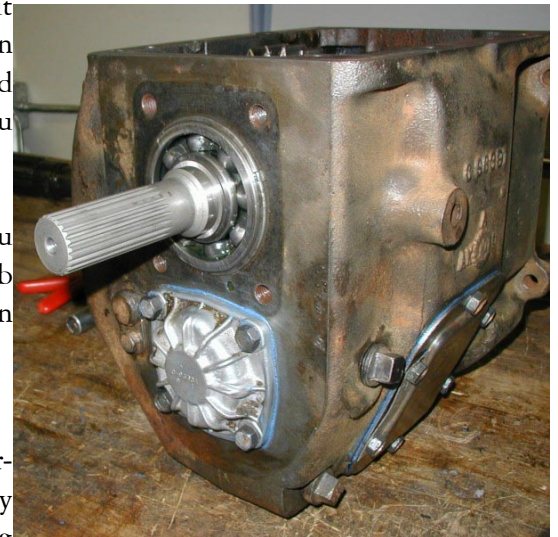
Shifter Assembly Installation

Line up the shift grooves in the neutral position as well as the shifter to simplify its installation. With a new gasket but no RTV in place, gently lower the cover onto the transmission case, making sure the shifters pick up the appropriate sliders in the transmission. Test shift through the gears. Some installers like to spin the input shaft pilot tip with a drill (read, Large Chuck - ~.750") and listen for any noises.

About Selective Gaskets

Ford and Dodge used to prevalently offer a gasket kit for the front bearing retainer. Addition or subtraction of these variable thickness gaskets is the mechanism that sets the shafting end play in the NP435 with the tapered input bearings.

Ford and Dodge have stopped making them and we have purchased a significant but dwindling supply to include with our master 435 kits. No manufacturer has yet to make a set. As such, you may be faced with cutting your own from gasket stock, as available from auto parts houses. Use the provided gasket as a template.



Once satisfied with the operation, RTV the shifter gasket like any other. Torque the shifter bolts to 20 ft. lbs. in a crossing pattern.

Transmission Lubrication

Fill the transmission with the right gear, usually 85W-140 for most climates. GL-4 oil is great for the NP435 as are GL-5 rated oils. Since most of the NP435 has no bronze synchronizers to which the GL-5's higher acid content can corrode, you can use either. Parasynthetics or a conventional/synthetic mix is acceptable and we feel it is a good idea. We like to fill through the top cover, as it's a good opportunity to douse the gears and shafts, not to mention the speed to fill.

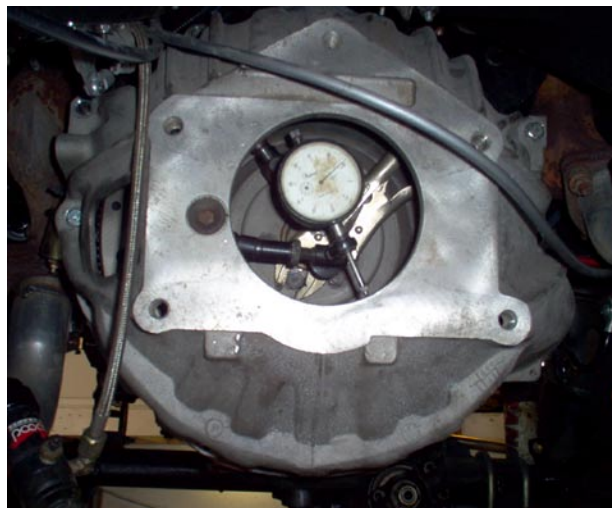
Bellhousing Alignment

On any engine using a standard shift transmission, with or without an adapter, it is important to check the bellhousing locating bore location relative to the crankshaft. The potential for transmission failure or premature wear is so great, due to misalignment at this point, that no engine should be assembled without being checked. The checking procedure is quite simple. Correcting misalignment is not so simple but must be done to insure normal service from the transmission. A dial indicator is required, as well as a suitable means to mount this instrument on the engine crankshaft.

A dial indicator (right) is a device that has an arm or contact point, suitably connected to a pointer, that moves in front of a dial with markings on its face. These markings usually represent .001" each. The purpose of a dial indicator is to measure in thousandths of an inch that can be read directly on the dial of the indicator.

To check a bellhousing, mount it on the engine it's going to be used with, make sure there are no burrs or dirt on the block or bellhousing. All bellhousing to block bolts should be in and tight. Mount the dial indicator on the crankshaft of the engine using a suitable magnetic base attachment or mechanical clamping means. The contact point of the indicator should be touching the bore of the bellhousing. The indicator must be mounted rigidly enough so it does not move on its mounting to prevent false readings. Rotate the engine by hand with the spark plugs removed and observe the reading on the dial. Keep adjusting the dial assembly until the needle moves the least amount per rotation. When you have achieved the least amount of needle movement through the 360 degree sweep of the indicator, this is your runout. You can then determine the direction it is offset by the movement of the needle.

The total number of thousandths misalignment of the bore relative to the crankshaft is read directly on the dial. Total runout should not exceed .007", with .010" being maximum. The greater the misalignment, the sooner transmission problems and failure will occur. A symptom of misalignment is unusual wear of the pilot bushing. We have checked stock Chevy bell housings on engines that were out more than 1/32" (.032"). Some Ford one are reportedly worse. Anything over .010" runout must be corrected before the engine and bellhousing are put in service or you can count on pilot bushing, transmission, and clutch problems, followed by transmission failure. The simplest way to correct misalignment is to try another bellhousing or bell housings. Machining the bellhousing is the best cure but offset dowel pins are simpler. Shims between the block and bellhousing will also work if you have the patience to use this method. Offset dowel pins are sometimes available from speed shops locally or online.



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.



American Made

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.



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