

Introduction

We hope that your engine to transmission conversion goes very well, and that the installation of your Novak adapter works as smoothly as it is designed to. This kit is for adapting most GM standard shift bellhousings to the Aisin Warner AX15 five-speed transmission as found in 1988-1999 Jeeps, and the NV3550 as found in 2000-2004 Jeeps.

Despite your experience with automotive work, we strongly advise you to read these instructions, in which are contained the requirements, tips, hints and tricks of performing these conversions, both in our own facility and information we've gained from discussing this upgrade 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.

Note to the Installer

This document and the use of any Novak products assumes a safe and adequate working knowledge of the automotive systems involved. We do not know and there is no way for Novak to determine the skill level of the customer and/or the installer of Novak products, or for Novak to publish all of the foundational information that an individual should know before attempting these advanced automotive upgrade procedures. Vehicular conversion work can be among the most difficult of automotive mechanical and electrical tasks and it is upon the customer to ascertain whether they are working within their expertise or whether they should acquire assistance.

Novak products and procedures are intended and recommended for off-road use only.

Additional Instructions

This instruction set is intended to be used in conjunction with *The Novak Guide to Clutches, Linkages & Bellhousings*, found on the Novak website at: http://www.novak-adapt.com/knowledge/clutches_etc.htm . This document is invaluable and is the greatest compilation of clutch set-up and troubleshooting knowledge available.

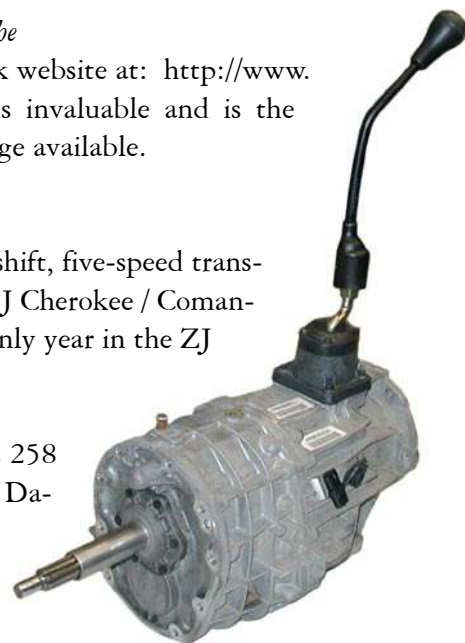
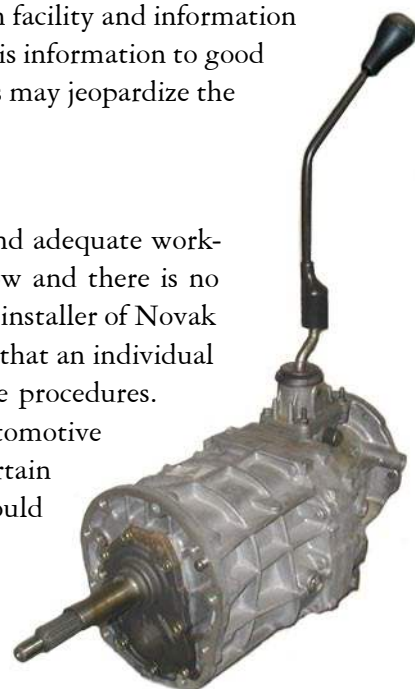
About the AX15 Transmission

The Aisin Warner AX15 transmission is a medium-duty, standard shift, five-speed transmission introduced in the 1988 (mid-year) YJ Wrangler and XJ / MJ Cherokee / Comanche Jeeps, and found in 1988-1999 Jeep XJ, YJ & TJ models. Its only year in the ZJ Grand Cherokee was 1993, and only with the six-cylinder.

The AX15 is a medium-duty transmission found behind the AMC 258 and the Mopar 4.0L (242 ci) I6 engine. The AX15 is also found in Dakota trucks and is closely related to the Toyota R154 as found in the Supra Turbo and Four Runner, though the case rear halves and gear ratios vary. It is also related to or referred to as the AN5, AR5, MA5 in GM and Isuzu applications.



JEEP® POWERTRAIN SUPERIORITY



About the NV3550 Transmission

The New Venture Gear 3550 was released in the Jeep TJ Wrangler and XJ Cherokee in 2000, as the replacement to the AX15 transmission. It is also found in Dodge downsized pickups. It's last year in the Jeep was 2004.

Adaptation

Preparation

Transmission removal is facilitated by removal of the shifter assembly from the transmission. This shifter assembly is held down by two bolts and two studs, and can be accessed through the shifter hole in the floor, or from under the Jeep with the cross member removed and the drivetrain lowered.



Remove the 4.0L bellhousing from transmission from within the bellhousing after the 4.0 engine has been pulled. We do recommend a good washing of the transmission. It is particularly vital that the front face be clean so that nothing can present a risk of the bellhousing/adaptor assembly being installed unparallel.

A GM style bearing retainer is provided with each adapter kit so that you can use any of the common GM throwout bearings.

There are two styles of bearing retainer for the AX15. Models up through 1993 did not use a throw out bearing sleeve since they were made for use with the (problematic) internal hydraulic release bearing. No further preparation is required for transmissions of this style. However, 1994 and later versions did use a throw out bearing sleeve and installation of the new GM retainer provided with your GMAX kit requires that you cut the tube off of the AX15 / NV3550 input bearing retainer. This need not be an elaborate process. Simply remove the retainer by taking out the existing bolts. A hacksaw, wheel grinder or even a mill can be used. Cut the retainer just forward of the line where the cast surface meets the machine surface. Deburr the edge. Once done, be sure to clean the retainer of any shavings or filings. Reinstall the modified retainer as removed.

Bellhousing Clearancing for NV3550

The GM bellhousing will need to be machined to clear the shifter boss on the NV3550 transmission. There's no other reasonable way around it and it does not need to be difficult or elaborate. Follow these steps:

Position the adapter onto the GM bellhousing, lining up the bolt holes and then using the adapter as a template to trace the cutout onto the bellhousing rear face. Remove the adapter and using successively larger drills, drill to the diameter as marked. If you do not have access to a drill this large, an air file may be helpful. Do not use any kind of grinding wheel to perform this task as they can explode when grinding at non-ferrous metals.

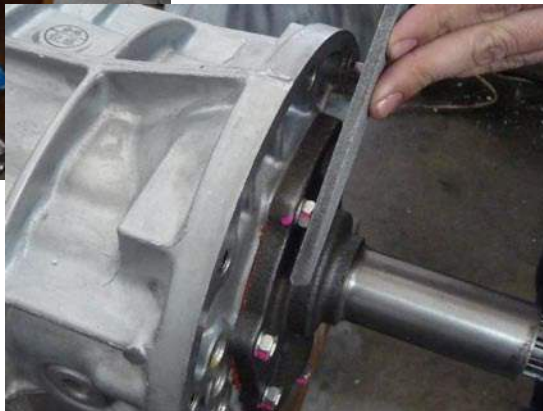
This operation will not weaken the bellhousing to any appreciable degree and will allow for the shifter pocket boss on NV3550 transmissions to nest into the bellhousing and permit the adaptation assembly to continue.



Cut the retainer snout / throwout sleeve roughly at this location.



If your transmission has raised edge extended height hex bolts, they may need to have their perimeters filed down, or replaced by a standard height bolt to allow the adapter to sit flush to the transmission face.



Assembly

As these transmissions uses dowel pin alignment, and that this alignment is crucial to the life of your transmission, you will notice that the dowel pins will fit tight into the adapter itself. Make sure there are no nicks or burrs that would prevent it from installing easily.

Slide the adapter on carefully keeping it parallel to the front face of the transmission. If the plate gets tilted, it will prevent it from sliding on. You may wish to use a soft face mallet and gently tap each side in alternate succession.

The adapter is attached to the transmission with metric socket head bolts with a unique 25 thread for standard 10mm bolts, as thread

pitch. Do not substitute them damage will occur. We recommend that you torque them to 15ft. lbs. in a 10 ft. lb. increment, and then a 5 ft. lb. increment in a crossing pattern. The design of the adapter and the goals we held for its strength precluded us from using a deeper counterbore for conventional lockwashers. Therefore a light amount of thread locking compound such as Loctite™ Blue must be used.

The GMAX15 adapter will work with most conventional GM bellhousings. Post-'67 truck bellhousings require our #GMAX15 kit with our optional sizing ring adapter for the later bellhousing's 5-1/8" bore. Do not attempt to use a smaller bore adapter with a large bore bellhousing, as mislocation and transmission damage will almost invariably occur.

Prepare the bellhousing by reaming out the four threaded holes on the rear face. This can be done with a drill, round or rotary file. Use the bolts to gauge that you have enough clearance. The bellhousing will bolt to the adapter from within. We have provided four 1/2"-13 bolts for this purpose, but note that some bellhousings have thicker or thinner bosses. You may have to use some of your original bolts or supply new ones if your bellhousing is unique. Make sure you are getting the maximum engagement into the adapter threads, without pushing against the face of the transmission itself. We do recommend that you use flat washers against these bolts to spread the load over a wider area. You may use lockwashers or a thread locking compound to lock these four bellhousing bolts. Torque them to 45 ft. lbs. in two successive and incremental steps, following a crossing pattern.

Installing the Pilot Bushing

Before installing the transmission to the engine, the special pilot bushing you purchased from us (separately) must be installed in the GM crankshaft. We have provided the special pilot bushing according to the year of transmissions you have. You should test fit it to the transmission input shaft pilot tip to be sure it is correct.

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

Our adapter is made from a billet of 6061 aluminum, heat treated to T6 condition. It is actually stronger than cast iron. In spite of this, the adapter, like anything else, is not indestructible. Misalignment, improper assembly, improper mounting, or incorrect driveshaft lengths, and miscalculated driveshaft geometry on shackle reversal setups are some of the things that may cause adapter failure. 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 workmanship.

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.



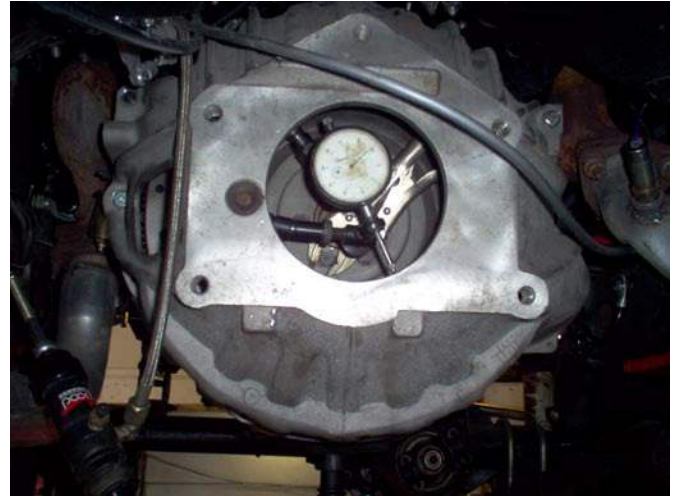
Bellhousing Alignment

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.

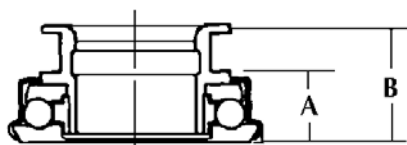


The total number of thousandths misalignment of the bore relative to the crankshaft is read directly on the dial. Total runout should not exceed .007", with .010" being maximum. The greater the misalignment, the sooner transmission problems and failure will occur. A symptom of misalignment is unusual wear of the pilot bushing. We have checked stock Chevy bellhousings on engines that were out more than 1/32" (.032"). 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 bellhousings. 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 available from speed shops locally or online.

GM Clutch Release Bearings

This chart shows the length of the bearing in inches. Most auto parts stores only stock a couple of these release bearings and they may not be the best ones for your swap. This chart lists five bearings by the critical "A" measurement; groove to face dimension as referred to in this article.

-A- length	-B- overall length	Part number
3/4	1-17/64	N 4068
15/16	1-5/8	N 1741
1	1-41/64	N 2001
1-1/16	1-11/16	N 1466
1-1/4	1-7/8	N 1086



Clutch System

Clutch Release

Most installers will opt to run their hydraulic release, using the existing Jeep master cylinder assembly. If this is the case, a very easy clutch release slave, bracket and arm system we offer for use with most modern (1970-1991) Chevrolet bellhousings is our #HCRC kit, shown below.

Use the proper clutch release bearing for the clutch being used. There are six different length release bearings for GM clutches. Which bearing to use depends entirely on the pressure plate being used. See the accompanying chart.

If the motor you are using will be developing a good deal of torque, you may wish to drain the transmission and replace its fluid with a synthetic ATF lubricant for extended wear.



Conveniently, the AX15 has a 1-1/8", 10 spline input shaft. GM clutch disks commonly have the proper disk hub to accommodate this. Use a pressure plate that is matched to your engine and its flywheel. Nearly all GM trucks through the decades use this spline configuration with their manual transmissions.

Drivetrain Positioning

Our experience shows that the AX15 / NV3550 and the 231 transfer case will move forward as much as 3" with Chevrolet V6/V8 conversions. This is quite advantageous to lifted Jeeps whose owners are seeking better driveshaft angles. The crossmember may be left in the original location, with the only modifications being to the transmission mount. Two holes may need to be drilled into the crossmember for relocation. On our TJ conversion project, we shifted the transmission forward on its mount, using a simple bracket.

Any change in positioning may necessitate modifications to the transmission shifter. The example, below, has been lengthened by welding in an extension rod and subsequently bent for the proper angle. Make sure you remove the plastic ball bushing on the end, as well as the shifter stick. A vice and soft face mallet will facilitate the removal of the stick, as it is attached by a notched, press-fit.

Conclusion

While reading through these instructions, and especially while performing the engine 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.





- Novak Kit #GMAX15 includes:
- Adapter plate
 - Retainer, GM, front
 - Bolts (4), 5/16"-18 X 7/8", socket head
 - Bolts (9), M10-25, socket head
 - Bolts (4) 1/2"-13
 - Lockwashers, split
 - Instructions

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.

©Novak, Inc.
www.novak-adapt.com
support@novak-adapt.com
 877.602.1500

