

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 the most common Ford standard shift bellhousings to the Aisin Warner AX15 five-speed transmission as found in 1988-1999 Jeeps. We strongly recommend that you read these instructions no matter how much experience you have had with this kind of work.

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 v 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.

Adaptation

Preparation

Transmission removal is facilitated by removal of the shifter assembly from the transmission. This shifter assembly is held down by either two bolts and two studs, or just 4 bolts, 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 the 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/adapter assembly being installed unparallel.

A Novak input bearing retainer is provided with each adapter kit, which is made so that you can use any of the common Ford style throwout bearings, or the Novak TB2 adjustable throwout bearing.

There are two styles of bearing retainer for the AX15. Models up through 1993 did not use a throw out



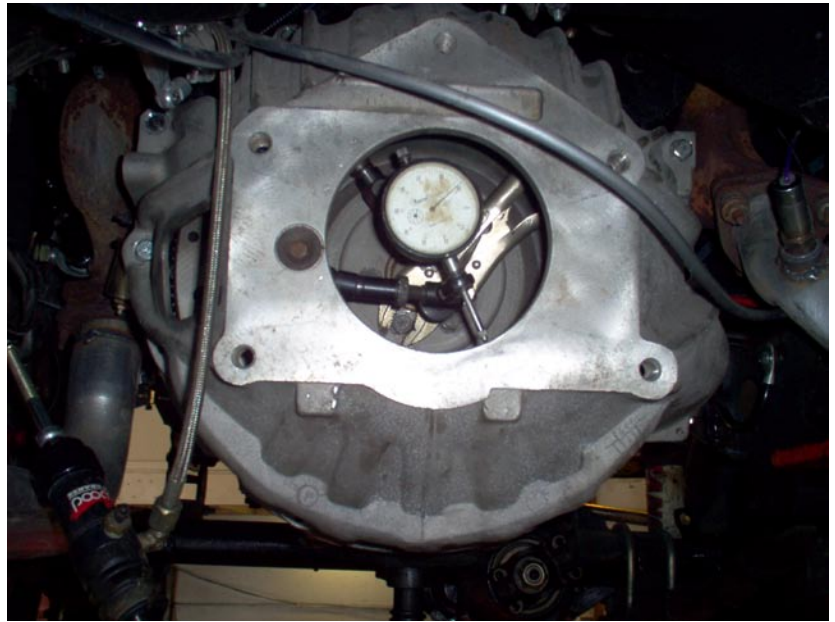
JEEP POWERTRAIN SUPERIORITY



bearing sleeve since they were made for use with the (notoriously problematic) internal hydraulic release bearing. The 1994 and later AX15 and 3550 versions did use a throw out bearing sleeve. Our FMAX adapter and provided input bearing retainer will replace both versions of the AX15 factory input bearing retainer.

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 (image, 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.

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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"). 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 available from speed shops locally or online.

Installing the Pilot Bushing

Before installing the transmission to the engine, the special pilot bushing provided must be installed in the Ford 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.

Clearance Bellhousing to Adapter Holes

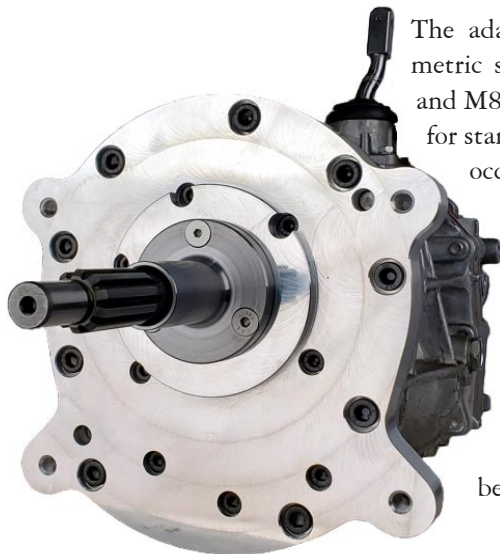
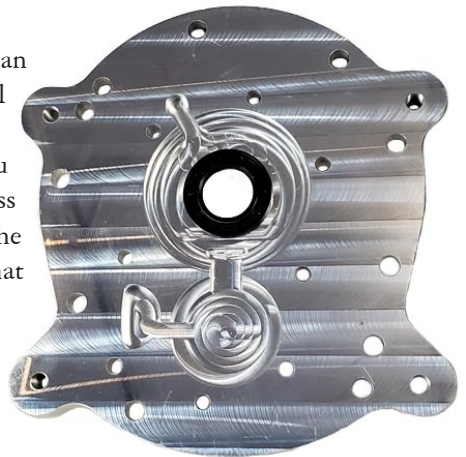
The bellhousing will bolt to the adapter from within. Prepare the bellhousing by reaming out the four threaded holes on the rear face. This can be done with a drill, round or rotary file. Use the provided 7/16" bolts to gauge that you have enough

clearance to clear 7/16"-14 bolts.

Adapter to Transmission Assembly

At Novak, we try to assemble all products and kits to the fullest extent that we can prior to shipping your order. For the FMAX15 kit, the only item we can truly install prior to shipping is the input shaft oil seal into the backside of the adapter plate. The seal should be installed, but should you receive your kit without this seal installed you will need to do so. Using an arbor press, or similarly save and effective means, press the oil seal into it's race in the backside of the adapter as seen in the image, right. The seal should be installed face down so you should be able to see the tension spring that hugs the inner diameter.

Next, install the input retainer to the front of the adapter and secure it with the three (3) provided 5/16"-18 flat socket head bolts (image, right). As the AX15 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 M10x1.25 and M8x1.25 thread pitch. Do not substitute them for standard 10mm bolts, as thread damage will occur. We recommend that you torque them to 20 ft. lbs. in a 10 ft. lb. increment, and then two 5 ft. lb. increments 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 (provided) must be used.

The FMAX adapter will work with most conventional Ford truck and some car bellhousings.

Adapter to Bellhousing Installation

We have provided four 7/16"-14 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 (provided) or a thread locking compound to lock these four bellhousing bolts. Torque them to 40 ft. lbs. in two successive and incremental steps, following a crossing pattern.

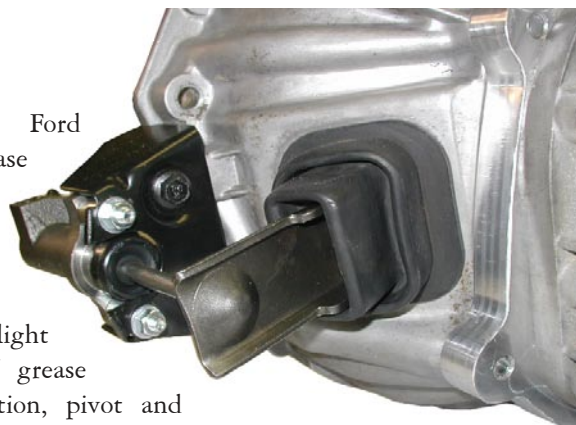




Clutch System

Install the Clutch Fork Assembly

Now, install the Ford style clutch release (throwout) bearing and its release fork. Make sure to use a light amount of grease on all friction, pivot and sliding points.



Clutch Release

In most Jeeps that feature these transmissions, you may want to use the factory hydraulic clutch linkage system. You have the option of using an internal (concentric) hydraulic throwout bearing, or you can use a more conventional external slave cylinder with a release arm, as we have done in the picture shown below, on the right. On this example, we used a Jeep CJ slave cylinder and a modified version of the Ford hydraulic bracket that came with the hydraulic release style bellhousing. If you have purchased the Novak Hydraulic Clutch Retrofit kit for Ford bellhousings (HCRF), included in this kit is Novak's Ford slave cylinder mounting bracket, as seen in the image below, left.

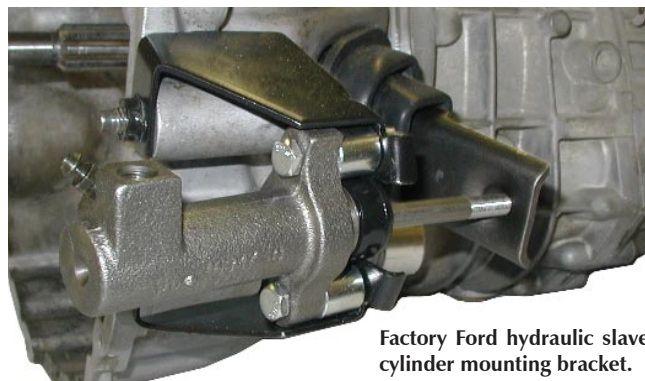
Note that the Novak slave mounting bracket faces opposite of the factory Ford slave cylinder mounting bracket. This is to position the slave cylinder further away from the clutch release fork for two reasons;

- 1) Proper slave cylinder placement - Novak's slave cylinders have ~.5" more throw than most factory slave cylinders.
- 2) To offer maximum adjustability. The adjustable pushrod in your Novak HCRF kit can be adjusted to fine tune your clutch system. We strongly recommend you have no less than 10 threads engaged with the push rod and domed nut. This will offer adequate strength, as well as more than sufficient adjustment.

****The slave mounting flange angles the pushrod inward towards the bellhousing. If you have installed the slave mounting bracket backwards, your pushrod will be angled away from the bellhousing and will not align with the clutch release fork.**



Novak HCRF kit



Factory Ford hydraulic slave cylinder mounting bracket.

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.

Drivetrain Positioning

Our experience shows that the AX15 and the 231 transfer case will move forward as much as 3" with Small Block 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 one of our TJ conversion projects, we shifted the transmission forward on its mount, using a simple bracket.

Any change in positioning may necessitate modifications to the AX15 shifter. The example (image, right) has been lengthened by welding in an extension rod and subsequently bent for the proper angle. While you are welding, 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

We suggest that you keep these instructions for future reference. For questions concerning your conversion, contact us. We'll be pleased to answer your questions.

There is no final word to our instruction packages. If you have a question you feel this information should have covered and didn't, please let us know about it. You are also welcome to submit your suggestions, ideas and images that you think we should include here which may help future conversion installers. Note our contact information below.



FMAX15 CONTENTS

- FMAX15 adapter plate
- Retainer, Novak FMAX15
- Bolts (4), 5/16"-18 x 7/8", socket head, flat
- Washers (4), 5/16", flat
- Washers (4), 5/16", split lock
- Bolts (9), M10x1.25-25mm, socket head
- Bolts (8), M8x1.25-20mm, socket head
- Seal, oil, input
- Bolts (4), 7/16"-14 x 2-1/4", head head
- Locktite™ Blue
- Instructions



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.



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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