

Introduction

We hope that the installation of your new Novak shifter goes very smoothly and that you achieve the improved results with your Jeep® that you intend. This guide covers the principles of installing our shifter assembly on Jeep New Process / New Venture 207, 231 and 242 transfer cases.



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 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.

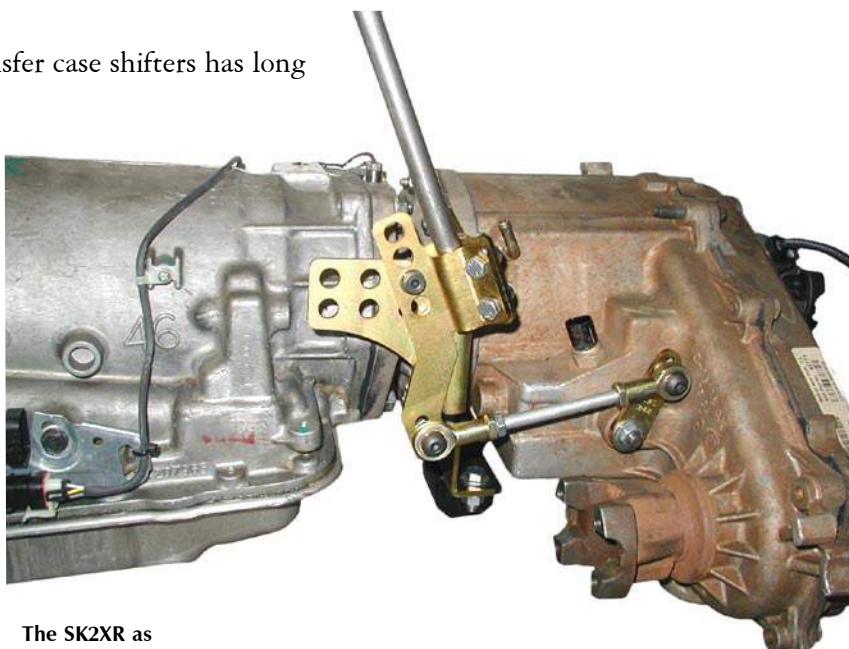
Compatibility

Because of the many variations of shifter linkage systems offered with these transfer cases - from YJ & TJ Wranglers, to XJ, MJ and ZJ Jeeps, and their variances of them from year to year - our shifter replaces everything from the shift plate at the transfer case, right up to the shifter knob in the driver's hand - in all of these Jeeps. It will shift the 207, 231 (four position) and 242 (five position) transfer cases, as well as 4:1 low conversion cases, and units with aftermarket "2 Low" shift cams.

This is a universally designed shifter that will accommodate all the above Jeeps with factory powetrains as well as Jeeps with transmission conversions using all Novak and possibly other brands of adapter assemblies.

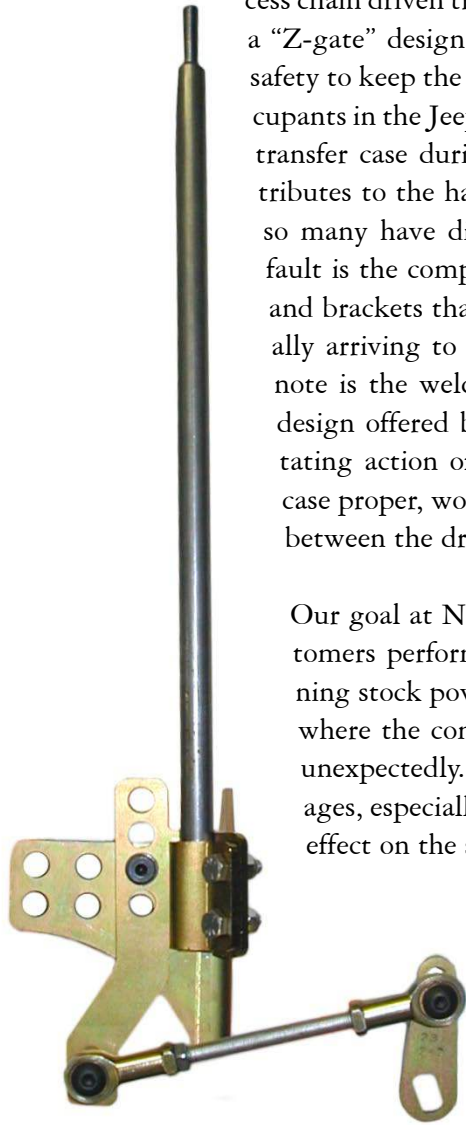
About Transfer Case Shifters

A trend of "dumbing down" transfer case shifters has long been in effect. Original Jeep transfer case shifters of the WWII era Dana 18's were double stick versions. These were very simple, reliable controls that took some initial thinking on the driver's part to figure out. Dana 20's and some later Dana 18's received a single lever to simplify operation. However, some Dana 20's began to receive complex remote-style shifters that have aggravated many a Jeepster in their operation as well as reliability.



The SK2XR as assembled to a 4L60E transmission. Also, all Novak and many other aftermarket adapters are compatible with their respective transmissions, manual or automatic.

With the advent of the New Pro-



cess chain driven transfer cases, a single shifter with a “Z-gate” design was introduced, ostensibly as a safety to keep the operator or any unrestrained occupants in the Jeep from inadvertently shifting the transfer case during operation. This Z-gate contributes to the hard, clunky, rigid feel of shifting so many have disliked. Perhaps at even greater fault is the complex maze of linkage rods, joints and brackets that zig and zag their way, eventually arriving to the transfer case shift plate. Of note is the welcomed simplicity of the elegant design offered by New Process, in that the rotating action of the shift plate on the transfer case proper, works in a clean, smooth manner - when independent of the OEM linkages between the driver and the transfer case itself.

Our goal at Novak was to simplify the shifting mechanism, at first for our many customers performing engine and transmission conversions, but also for the many running stock powertrains and unhappy with the shifting action, and the many situations where the complex linkage causes the transfer case to pop out of its range or mode unexpectedly. Our assembly also eliminates the bindings that occur in the factory linkages, especially those caused by flex when on the trail or rocks, that have a detrimental effect on the shifting process, and therefore on the performance of the Jeep.

Suggested Tools

Please note that you will need a press, torch or other suitable bending device to bend the shifter stick (provided) to the configuration that best suits your particular configuration and preferences. Also:

- Conventional open and box end wrenches
- Socket, hex (Allen) wrenches
- Conventional socket set

Benefits, at a glance

Restore and improve shifting action in Jeeps with suspension and especially body lifts.

Provide a clean shifting mechanism for conversion transmissions being adapted to the Jeep transfer cases.

Provide a cleaner shift feel and greater sense of control to the driver of the Jeep.

Eliminate shifter kick-outs and transfer case damage by replacing problematic factory linkages.

Shifter Assembly Replacement

Preparation

For the ease of installation, if you are installing the shifter when the transfer case and transmission assembly is in the Jeep, we recommend removing the Jeep crossmember. This will provide a lot more working room. Before removing the crossmember, be sure to support the transmission assembly with a floor jack and jack stand. It is also helpful to remove the front driveshaft from the transfer case.

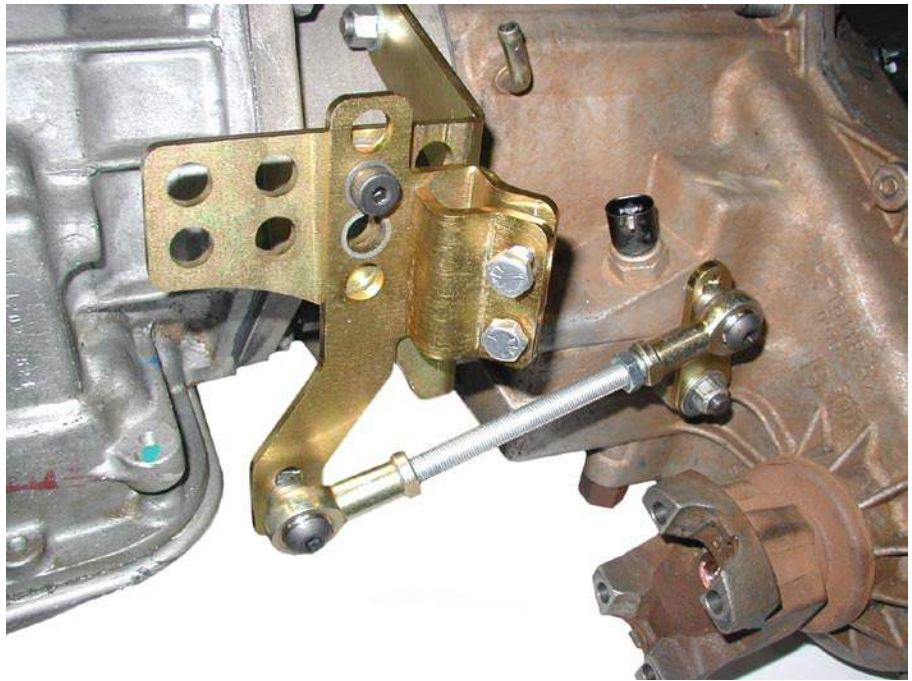
OEM Shifter Removal

The Jeep's floor console needs to be removed. This is usually done with 3-5 screws going into the floor, and on TJ and XJ models, two or more screws into the dash console. Remove any factory shift knobs and levers. Now that these items are out of the way, it is time to remove the factory shifting assembly. It is best that the entire linkage system be



removed. Remove the 'Z' Gate. This is the bracket mounted to the floor under the console. The second linkage item to remove is the mounting bracket that is located on the underside of the body tunnel. Once these things are detached, the remaining linkages should come out quite simply.

The next part to remove is the bracket that is fastened to the Jeep transfer case. It is connected with two (of six) bolts or nuts at the 12:30, and 4:00 positions. Leave these nuts detached, for now. Expect to use a 9/16" socket, and in some situations, a wobbly joint with extensions.



Novak Shifter Installation

This shifter kit has already been assembled at our facility in the manner that is most common for YJ, TJ and XJ installations. However, you may make adjustments to best fit your Jeep. We do recommend that you start with the bearing rod ends in the center hole of the three contiguous holes available in both the lever bracket and the transfer case pivot bracket.

Anchor Bracket Installation

Install the main "L" shaped anchor bracket. This installs on the same two transfer case adapter bolts that the previous bracket was removed from. You can use your existing fastening hardware (typically studs with nuts). Retighten and torque to 38 ft. lbs.

Lever Bracket Installation

We recommend you install the lever bracket in the second hole from the top, to start with. The stackup is:

1. Shoulder bolt
2. Flanged bushing / spacer
3. Lever bracket
4. Wave washer
5. Anchor bracket
6. Flanged plane bearing
7. NyLock nut (5/16")

Tighten nominally to keep the assembly together during mock-up. You may wish to use a plain 5/16-18 nut while you set things up, since you may be removing and installing it multiple times. When you are satisfied with its operation, you can install the NyLock nut for good.

Transfer Case Rotator Plate

The ideal situation:

1. The shifter cane will have ~1/2" clearance behind and ~1/2" clearance in front of the tunnel or console port at the frontmost (2H) / rearmost of its travel (4L).

2. The lever bracket in 2H will be at a complimentary angle in 4L, e.g., if its frontmost angle is 8 degrees forward, then its rearmost angle will be 8 degrees rearward. This is not a rigid rule, but the closer you adhere to it, the smoother it will shift.

The four vertical holes in the lever bracket are NOT for height adjustment. The height adjustment of the stick is achieved by sliding the shifter cane up/down in the clamp bracket. The vertical holes are to adjust the amount of throw / leverage that you want your shifter to have.

The semi-slotted holes (three in the lever bracket and three in the rotator plate) are for further fine tuning of your throw to best match your port in the floor.

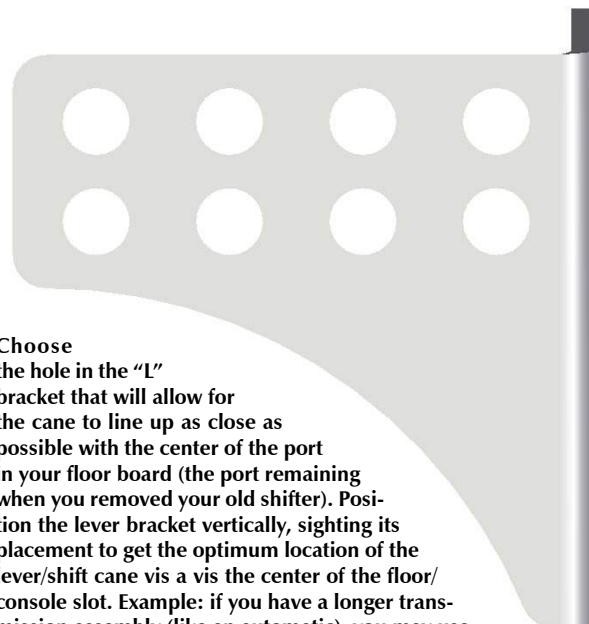
The factory 207, 231 or 242 shifter rotator plate needs to be removed. You will use the one provided in your kit, labeled 231/242 or 207, as appropriate. This plate will be installed in the upwards position. Expect to use a 9/16" box end wrench here.

Bearing End Installation

Install the bearing end ("Heim joint") onto their respective lever bracket and transfer case rotator plate. We suggest you start with the bearing ends in the middle holes of the lever bracket and the rotator plate. The stackup is:

1. Button head Allen bolt
2. Bearing ball
3. Flanged bushing / spacer, with the narrower portion towards the ball
4. Lever bracket OR rotator bracket, respectively
5. Flanged plane bearing
6. 3/8-24 nut

Choose the hole in the "L" bracket that will allow for the cane to line up as close as possible with the center of the port in your floor board (the port remaining when you removed your old shifter). Position the lever bracket vertically, sighting its placement to get the optimum location of the lever/shift cane vis a vis the center of the floor/console slot. Example: if you have a longer transmission assembly (like an automatic), you may use the front hole in the anchor plate. If you have a short transmission (like a truck four-speed) you will probably use the rearmost hole in the anchor plate.



Don't tighten the Allen bolt and nut on the bearing end on the shifter lever side yet. You're just mocking it up at this point.

Shifter Cane Installation

The two critical items here are:

1. The right leverage
2. The right throw

You need enough leverage so that it is not difficult to shift your gearbox, but to not have so much throw as to interfere with the port in the tunnel of your Jeep, or the console. If you have too little throw, the shifting will be more difficult and its resolution lower, such that the gear detents would feel less distinct to the driver. It is critical that the body not interfere, especially at the fore and aft limits on the cane. Remember that the powertrain and body can flex some, so a margin of $\sim 1/2$ " is recommended between the front and rear edges of the body / console and the foremost (2H) and rearmost (4L) positions of the cane. Note that side-to-side clearance is important, but not as critical, since the shifter kit will allow some left-to-right flex. Since the engine's power against for-



SM465 Installations

The SM465 is one of the strongest, but one of the wider truck transmissions ever built. If you have an SM465 with your New Process transfer case and a Novak #461 adapter, you may need to trim the front portion of the #SK2X anchor bracket off for clearance.

This modification is not a problem, as it is recommended that the lever bracket be installed in the rearmost holes when using the short SM465 transmission.

Note that this modification is only required if your transfer case is clocked in the highest position in Novak's clockable, SM465 adapter.



In this image, you can see our strategy here: instead of creating a compound bend in our cane (which is tricky) we're going to make two bends on the same plane, to effectively create a jog.

We'll then turn the cane, say - 30 degrees in the clamp bracket to accomplish the task of bringing the can to the left-right centerline of the floor port AND moving the cane to the front-back centerline of the floor port.



Everyone has their own idea of where their shifter should be at; some may want a real ape hanger and some will install the knob just above their Jeep's boot / brush.

Mark the height you think you would like your shifter knob to be installed at.

In this photo, we are using the tape to represent what would be the base of the chamfer in the shifter cane.



ward and reverse gears can cause the powertrain to rotate equally either left or right, center your cane as well as you can.

We have included a GripTwist rod that is ideal to the task of designing and mocking up the correct bends and angles that the actual steel rod will be formed to. You will also want to use this to determine the correct height of the shifter cane in the cab. Form the dummy rod roughly to your estimated shape required to come through the port in the floor and console. Now, you can then grab the secondary linkage rod and shift through the full range (from underneath the Jeep), watching the geometry of the linkage and the action of the cane.

Once you have this done you can bend the real handle to match the angles in your dummy rod. When you are satisfied with the angles, install the shifter cane into the



clamp system on the vertical bracket and tighten the clamp with the provided 5/16"-18 bolts and nylock nuts. Remember that to get your height just right in your console, you will adjust the cane up and down. This may require you to come back to this step a couple of times until it is just right and there is no stoppage occurring on the floor or console itself.

Because the overall height of the shifter cane will shorten some by virtue of the bends you are making, follow this procedure: align your mark with the base of the chamfer in the cane. Then “roll” (not



slide) the curve in the dummy rod down the actual cane. Stop when the apex of the bend touches the cane, mark the steel cane at that point. Then, continue to roll the dummy rod down the cane and when the deepest part of the trough of the second bend is close to the cane, make your second mark.

Light up your propane, butane or acetelene torch. Clamp your cane in the vice and heat your first mark until it glows and the steel becomes malleable. Using a mallet or by wearing thick leather gloves, bend the cane to match the first angle in the dummy rod.



Do not quench or otherwise accelerate the cooling of your shifter stick. This could cause brittleness and a possible break could occur. Let these bends air cool and slowly, for the strongest cane possible.



Repeat the procedure for the second or subsequent bends. Here, we used a vertical comparison during our second bend to verify that our second angle had achieved a complimentary angle to the first bend.



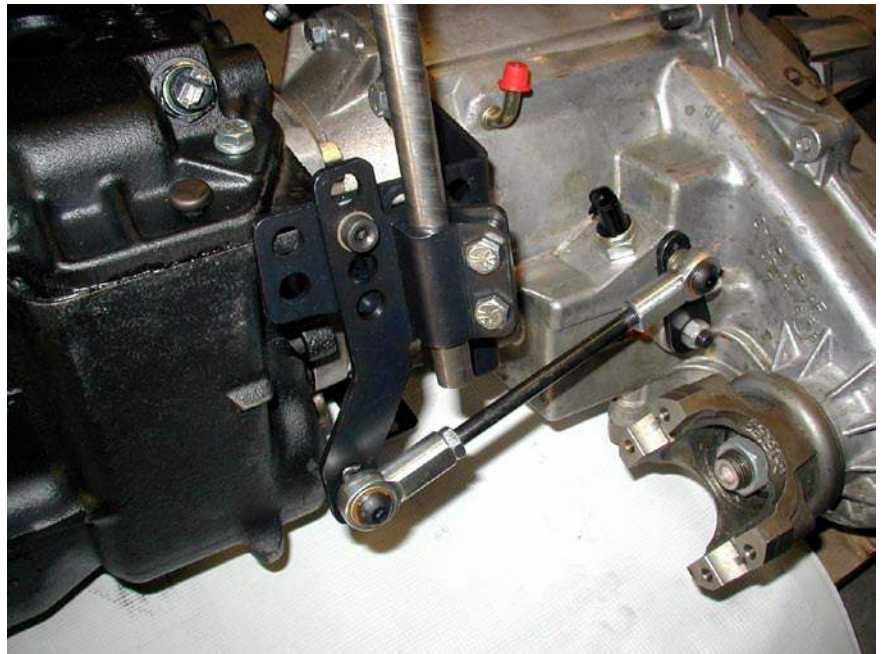


Line your dummy and actual rods up one last time. Mark the cut line, then make the cut. The steel is relatively mild and this can be done with a hack saw, cutoff wheel, etc.

Linkage Actuator Rod Installation

The linkage rod will need to be cut in most situations. Position the transfer case rotator plate into 2wd Hi (all the way back) and the shifter lever/cane in the expected forward, 2wd Hi position. Hold the linkage actuator rod up to the bearing ends and make two marks, equidistant from the ends.

Shift the transfer case rotator plate into into 4wd Lo (all the way forward) and the shifter lever/cane in the expected back, 4wd Lo position. Hold the linkage rod and compare your marks you just made. Make sure you have enough thread remaining for the jam nut and at least ~8 threads per side. If you're satisfied with these points, cut using a hack saw or cutoff wheel and bevel or chamfer the ends for easy threading.



Spin the 3/8-24 jam nut onto either end of the rod. Thread the linkage rod into the pivot plate bearing end. Remove the lever bracket bearing end and spin it onto the front of the actuator rod. When your satisfied with the geometry, install the bearing end on the lever bracket and tighten everything up.

Finishing

Reinstall the interior center console the way it was removed, making sure that everything lines up and there is no binding. When everything is how you want it, fasten the console to the floor.

Install the new aluminum shift knob. Tighten with 3/8" jam nut. Double check all your connections and bolts and make sure it's all tight and there are no loose ends. Reinstall the crossmember.

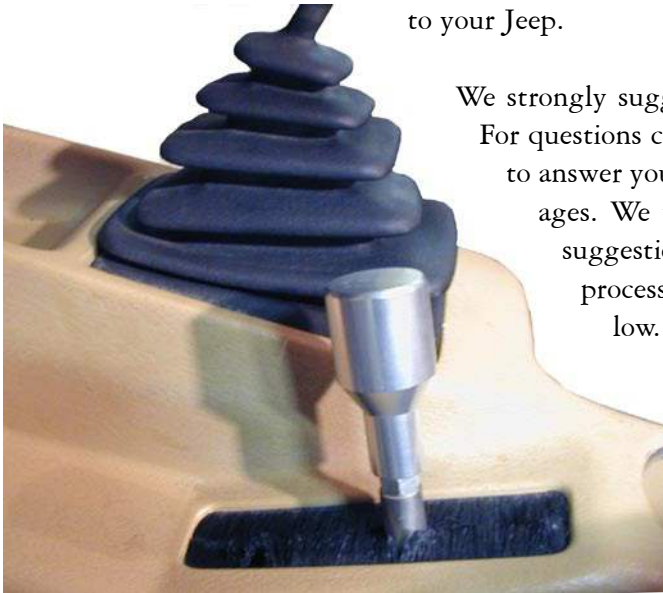
Shifter Flex

Note that a certain amount of side flex is actually designed into this shifter.

Nearly all of a Jeep's body vs. powertrain flex happens in a side-to-side or rolling fashion. We felt there should be some mechanism of flex in the shifter to allow for this. Otherwise, excessive rigidity would affect the body, console, shifter, etc.

Conclusion

We and so many of our customers have had great results with this shifter. It provides a much smoother shift and a custom, functional look to your Jeep. Any good installation should consider all the points in this article and also allow for time 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 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 #SK2X includes:

- ☐ Bracket, mounting (1)
- ☐ Shifter lever bracket (1)
- ☐ Clamp bracket (1)
- ☐ Pivot plate, 207 or 231/242 (1)
- ☐ Cane, shifter, threaded (1)
- ☐ Cane, dummy mock-up shifter (1)
- ☐ Flanged bushing / spacers (4)
- ☐ Linkage rod, threaded (1)
- ☐ Washer, spring wave (1)
- ☐ Washer, flat, 3/8" (1)
- ☐ Bolt, shoulder, 5/16" (1)
- ☐ Nut, nylock, 5/16" (1)
- ☐ Bolts, Allen, button head, 3/8-24 (2)
- ☐ Nuts, 3/8-24 (3)
- ☐ Ends, bearing, "Heim" (2)
- ☐ Instructions

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