

## Introduction

Ford V8 installations remain quite popular in Jeeps, including the Jeep TJ / LJ Wrangler. The Jeep TJ is certainly more sophisticated than their early CJ predecessors, but the swaps can actually be plenty successful. Below is a summary of the information we have gathered doing these and similar conversions, and includes the valuable insight of our many customers gained during their installs.



JEEP POWERTRAIN SUPERIORITY

Despite whatever your experience with this type of work may be, we strongly advise you to read these instructions well. Contained in these instructions are the requirements, tips, hints and tricks of years of performing these conversions, both in our own facility and information we've gained from discussing these swaps with our customers. Put this information to good use. Failure to implement the practices and information in these pages may jeopardize the quality of your work, as well as the product warranty.

## About Your Engine Mounts

Novak's weld-in engine mounts for the Jeep TJ & LJ Wranglers provide immense strength and a rapid and precise Ford Windsor Small Block V8 engine installation.



### Ease of Installation

We have sought the greatest ease of installation achievable with each of them without compromising engineering. Retaining the factory frame horns was not a real possibility, but we hope you'll agree that we've made them as easy as possible for a weld-in style mount.

### Strength

The Novak mounts feature a thick 3/16 steel construction and a welded box design for the maximum strength available. They employ the best engineering and geometry to assure that they'll survive even the wildest of engines.

### Placement

We have predetermined engine placement for the installer. There is a fine window in which these Ford engines can properly fit into a TJ / LJ Jeep, and we've done this design legwork already.

### Compactness

The mounts keep themselves out of the way of or integrate into the Jeep steering carrier bearing bracket, allowing the installer to keep the entire Jeep steering system operating as the factory intended. Our mounts also clear the factory upper control arms with factory or lifted heights\*. They will also clear the exhaust headers we recommend, our blockhuggers. Clearance from all other retained factory components is also excellent.

\* Note that sagging factory springs and / or modified axle bump stops could allow for upper control arm interference with the engine mounts or other components. It is the responsibility of the installer to verify a safe and non-interfering installation.

## Vibration Isolation

Each mount kit comes with our high-grade isolators that are gauged well for that ideal balance of isolation and firmness. The large, graded 5/8" bolts and all associated hardware are included. Additionally, Novak will always be here to inexpensively provide replacement isolator bushings, if needed - years down the road.

## Jeep TJ Information

By way of context, the Jeep TJ was conceived of in the early 1990's as the progeny to the increasingly popular YJ Wrangler. Much of the YJ had actually shared many features with the 1955 CJ and Jeep engineers envisioned a new Jeep universal truck with some fundamental differences. The primary difference with the new Jeep would be the coil suspension in lieu of leaf springs. Secondly, significant interior and instrumentation changes were introduced. Interestingly, the TJ was released right after the entire automotive industry's acceptance and implementation of the OBDII standard, whereas the 4.0 and 2.5 engines and powertrains made no significant changes in their move to the TJ.

Germane to this discussion is the frame and the coil suspension system, which called for the frame rails to arc in towards the engine to clear the coils. Also, the upper control arms posed a possible interference threat to conversion V8 engines and their accessories.

With all these things in mind, it was no small challenge to engineer a set of engine mounts that would put the Ford engine in the right location that would allow for all the right steering, suspension, accessory, cooling, fire-wall and hood clearances required, and still be easily installed by installers with varying mechanical experience.

## Preliminaries

### Body & Suspension Lifts

Contrary to conversion mythology, it is not typically necessary to install a body lift when installing these V8 engines in a TJ Wrangler. It is also not necessary to install a suspension lift or extended suspension snubbers for the purpose of the conversion. A Ford V8 can be installed in a factory TJ / LJ Jeep so long as factory springs are not excessively fatigued or collapsed.

### Air Conditioning

Air conditioning can be retained by using a Ford A/C compressor to feed the Jeep evaporator. You will likely have to replace the factory condensor in front of the radiator, since a radiator change is typically required, and you will need to run custom cooling lines per your particular installation. Also, be aware that you will need to choose the right Ford or aftermarket A/C compressor mounting brackets that will permit clearance of the suspension, fenders, steering and other components in the engine area.

### Factory Computer & Gauges

You have the option to leave your factory Jeep powertrain control module (PCM) in place if you want to retain your factory gauges. If you are using or building



Remove the air conditioning dryer / receiver by detaching the bracket and removing the spring clip.





a custom gauge pod, the factory PCM can be removed. If you're retaining the PCM, you need only disconnect the plugs that are directly related to engine management, which are typically the black and white connectors. To have the Jeep PCM run your factory instrument cluster, you will reconnect these at a later point according to *The Novak Guide to Wiring for Jeep PCI BUS Gauges*, available with our TJ engine mount kits.

### Jeep Transfer Cases

This guide is based on the retention of the 231 transfer case in your Jeep. They are extremely reliable, very durable, and easily and affordably adapted to your conversion powertrain. We do recommend the use of a heavy-duty output shaft or slip-yoke eliminator assembly with your NP231, for the sake of durability against your stronger motor and better driveshaft angles.

### Your Powertrain Assembly

It is recommended that you pre-assemble your powertrain outside of the Jeep. Follow the instructions provided with your Novak adapter kit to assemble your chosen gear-boxes behind your Ford engine. You should assemble the powertrain as completely as possible, including the headers, wiring, accessories, belts, clutch releases, air intakes, etc. At Novak, we actually pre-assemble and test run our powertrains prior to installing them into the Jeep. If you assemble as much of the powertrain as you can and follow this same paradigm, asking the question, "Given battery, fuel and coolant, could I run this engine on a stand?", you will be well on your way. Because of superior access to things and for organizational purposes, you will enjoy the work more and take a few hours off of your project.

This section precedes the others in that it is a very good idea to have the powertrain assembled to the fullest extent possible prior to disabling your Jeep for the conversion process.



**Preparation Details**  
Make sure that all A/C and heater circuits are plugged off to prevent ingress of contaminants.

Few things will add to your enjoyment of the project as much as a good pressure washing of the engine bay while it is open.

### Begin the Conversion

As with all other Jeeps, we'll begin by disconnecting the negative battery cable and by then disconnecting the coolant, fuel, air, vacuum, exhaust and electrical circuits into the engine. Once the coolant is drained, remove the radiator, A/C condenser, transmission cooler, any winches, etc. Now, remove the grille from the fenders and front crossmember. It is not necessary to remove the hood, as it may be tilted fully out of the way against the windshield frame.

### Powertrain Removal

It is usually recommended to remove not just the engine, but the transmission and



transfer case, even if you are retaining both of them in your conversion, such as with the AX15, NV3550 or NSG370 manual transmissions. Because the Ford engine will relocate the geartrain forward by about 2" forward, removal and assembly to your new engine outside of the Jeep is generally helpful and not difficult.

Drop the crossmember / skidpan assembly, supporting the transmission and transfer case with jack stands. Disconnect the front and rear drive-shafts and set them out of the way.



If your NP231 does not have an SYE kit installed, or if you have an NP231 with SYE or NP241OR transfer case whose fluid is due for change, drain the transfer case fluid. You may wish to do the same for the transmission.

Disconnect the transfer case shifter and speedometer connection. Remove the transfer case from the factory transmission adapter and set it aside. Note here that it is possible to remove the transfer case with the engine and transmission assembly as you thread them up and out of the engine bay. However, generally, it is easy to remove the transfer case. Disconnect the transmission shifter assembly from its housing. This is typically done by removing its four bolts that secure the shifter assembly to the top of the transmission. Disconnect the hydraulic clutch release line.



Unbolt the factory engine mounts from the frame horns. Safely secure a lifting jig to your outgoing motor and carefully pull it from the bay. Typically, the transmission causes the powertrain to tilt back and allows it to feed out from the engine bay at the proper angle, but having an assistant or two to guide it out is helpful.

#### **Factory Frame Horns Removal**

Remove the steering shaft support bearing bracket from the factory mounts and string the shaft and secure the bearing assembly up out





of the way. Total removal of the factory I4 or I6 frame horns and steering shaft support bracket is required. These frame horns can be removed from the frame using your preferred cutting method, i.e., plasma cutter, cut-off wheel, metal saw, etc. and grind the weld surfaces clean.

### Engine Plate Installation

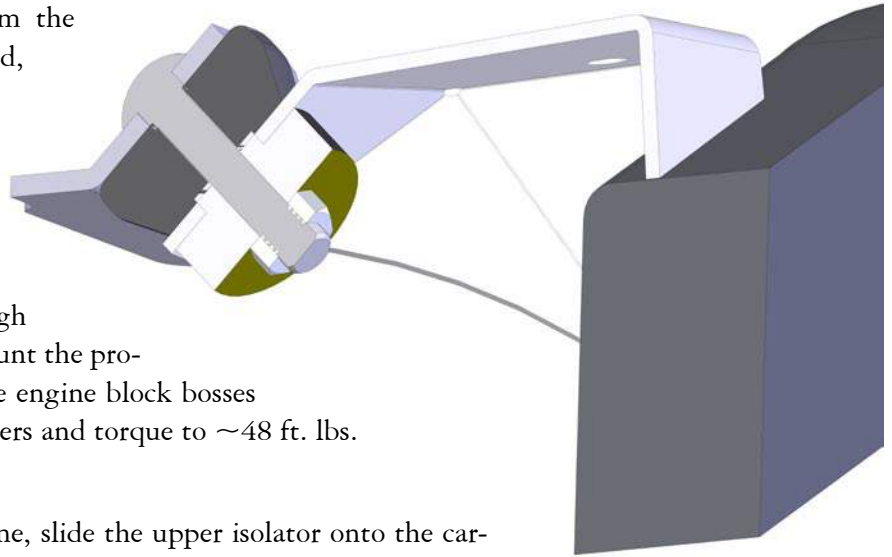
In preparation powertrain mock-up, insert the provided carriage bolt through the center hole of the block plate then mount the provided engine block mount plates onto the engine block bosses using the factory 7/16 bolts and lockwashers and torque to ~48 ft. lbs.

### Frame Horn Installation

With its taper facing away from the engine, slide the upper isolator onto the carriage bolt, followed by the provided Novak frame horns, then the lower isolator, then the lower nut as shown in the adjacent cutaway diagram - temporarily at this point. The horns taper downward towards the back of the Jeep, since they are being installed on the rear slope of the TJ engine bay frame section.

### Engine Mock Installation

With the mounts hanging on the engine, temporarily lower the engine down and check the fit of your V8 in the Jeep. Retain some of the engine weight with the hoist for your safety.



The driver's side engine bracket as measured from the crow's foot to the back of the front TJ cross-member tube is typically 29". The passenger's side bracket will typically position 28" from the cross-member tube.

The engine will be essentially centered in the Jeep.

It is critical at this stage to verify firewall clearance, radiator / fan clearance, and every other physical aspect of the installation into

the engine bay. You may wish to slightly move the frame brackets fore or aft to accommodate any particularities of your own installation. However, do not position the engine based on transmission position. Engine position is the driving factor of transmission position, no matter how unintuitive that may seem. Too many conversions go south because the installer is trying to maintain transmission location or existing driveshaft lengths, at the expense of good engine placement. That said, our Ford mounts are largely predetermined by our test installations and have a very narrow window of adjustment.

#### Important

Even though the engine mount location is predetermined on most of our TJ mounts, we still strongly recommend that you just tack in the engine mounts and not fully weld them in so you can test fit the engine. This includes mocking up the radiator and fan and checking for adequate clearance. You should also check firewall clearance.

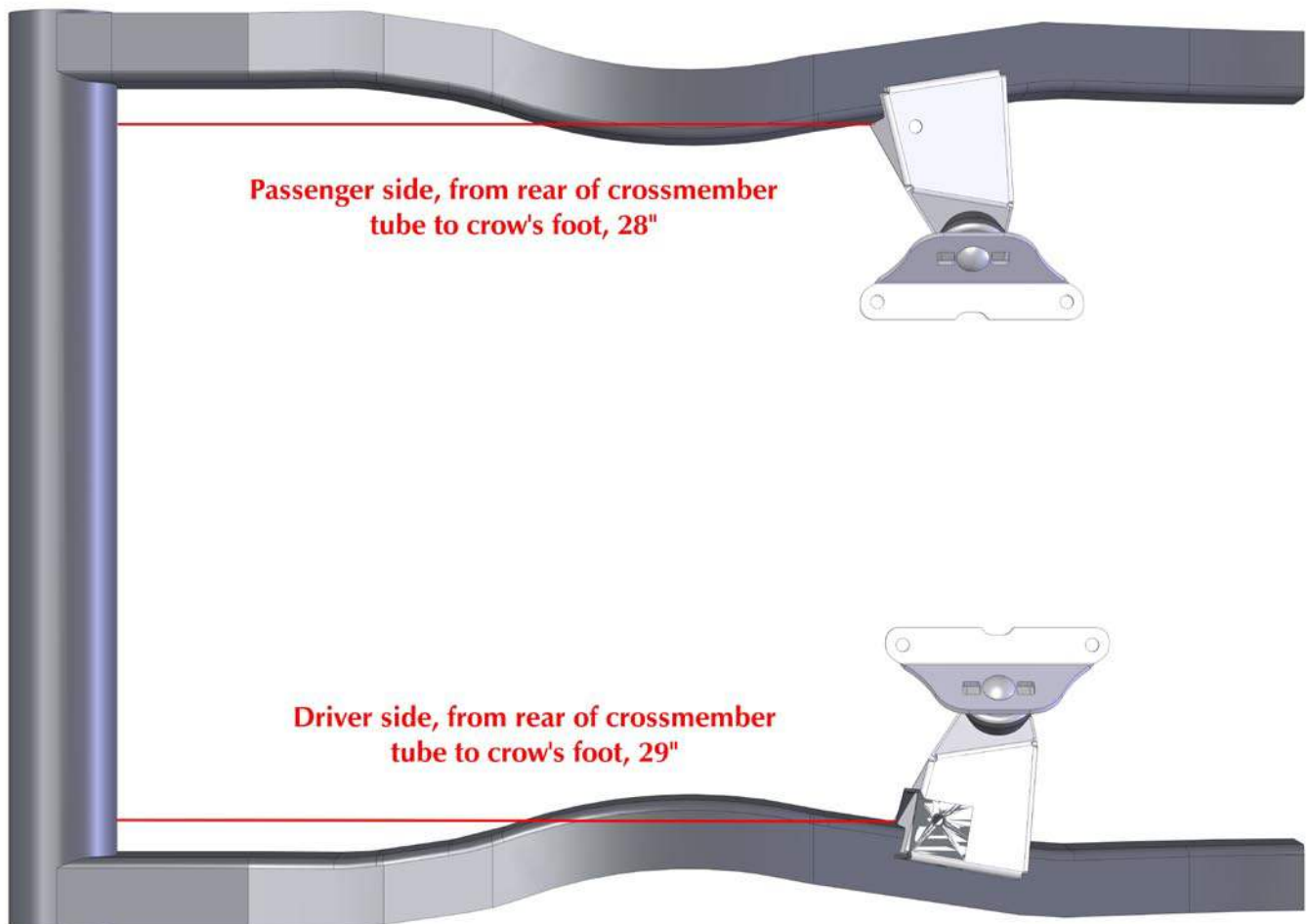


The frame brackets may be able to be slightly adjusted to optimize clearances. Remember that you also have the siamesed holes on the engine plates that you can use to slightly modify the position fore / aft if necessary.

The engine will tilt back about four degrees, as per the typical automotive industry standard. Consider this when positioning the engine and transmission. There should also be essentially zero yaw, meaning the engine crank / cam centerline will be parallel to the frame and longitudinal to the Jeep.

Once you are content with the position of the engine, you may tack your engine mounts into place. Do not fully weld them in until you are certain of your location.

You may wish to follow up with wire brush, solvent and paint on the frame and frame brackets prior to proceeding with the remainder of the engine conversion.





### Firewall Clearance

Some V8 engine conversions will require very minor clearancing of the firewall-to-tub seam. This clearance is required at the passenger and driver side corners. There is no need to cut the spot welds. You may wish to seal the cut metal with enamel and an appropriate sealant.

### Final Mount Welds

Once you're content with it all, lay MIG or stick welds along the entire edge of the brackets for a maximum strength connection to the Jeep frame. Allow your frame and bracket to air cool. Do not accelerate the cooling process with compressed air or water. We suggest you follow up by wire brushing and coating the brackets with primer and enamel as per your preference.

### Final Install of the Powertrain

It's now time to finally lower your motor into the Jeep engine bay if you haven't already done so.

Very carefully and with assistance, lower your powertrain into the engine bay. You can thread your transfer case into the Jeep tunnel with someone guiding it.

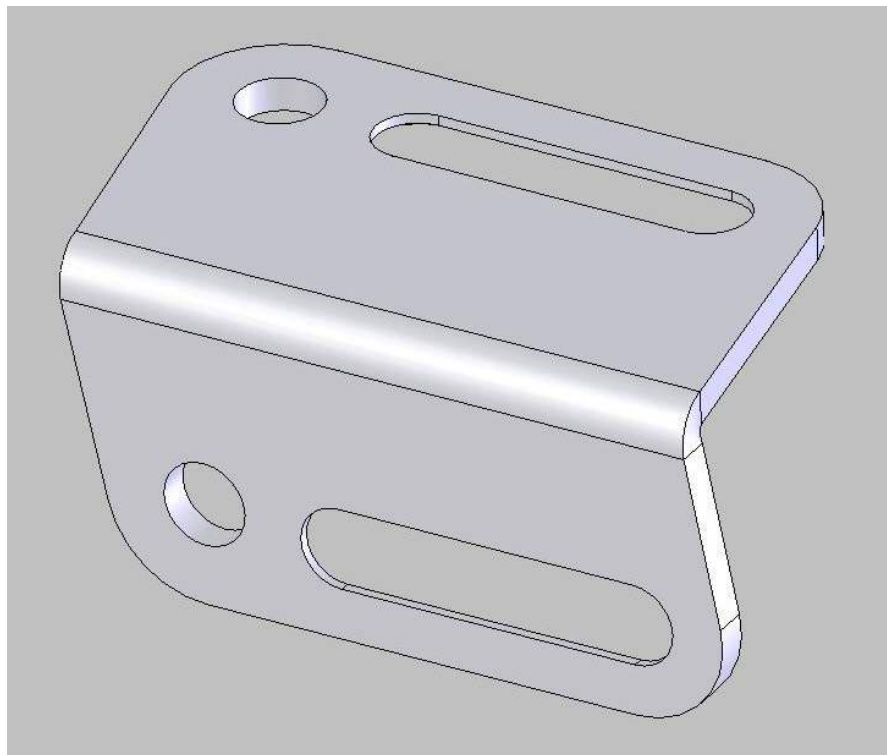
Lower in your new engine. Install the underside isolator mounts and install the provided TopLock nuts under the isolator bushings. Do not squish the bushings. Tighten them only to where they just start to deform. Overly tight bushings can cause excessive engine vibrations through the Jeep and will cause premature bushing cracking and failure.

### Steering

The steering system essentially remains essentially untouched. The Novak mounts will substitute for the factory steering support bearing base. If you have an I6 Jeep, you will use the supplied extension bracket which will platform under the I6 position steering carrier bracket.



You are working here with a very critical steering component and any errors you make can result in serious property damage, injury and death. If you are not confident in your ability to very securely reattach your steering shaft carrier bearing assembly or your engine mounts, consider the services of an automotive fabrication professional.



The Ford power steering pump will drive the Jeep power steering gear perfectly well. Hose fittings vary over the production span of the TJ. You may need to have a custom hydraulic hose made for your supply line.

The return line is simply low-pressure 3/8" hose, as is available from your local parts house. If you're feeling creative, you can even run this line through an external cooler to add to the life of your pump and gear in hard service situations.



### **Brakes**

You can retain your factory braking system all together. No changes are necessary from the standpoint of the conversion itself.

The Ford engine provides vacuum at the manifold for the TJ brake booster.

The ABS computer is separate from all systems and runs independently. No mechanical, wiring or hydraulic changes need occur here.

### **Cooling System**

The Jeep radiator may physically work with your Ford engine if it has the traditional Ford inlet / outlet location. However, the Jeep radiator is likely to be inadequate for cooling a V8 in most climates. As an alternative, consider the the Novak Kryoflow Radiator as being a tougher, more efficient radiator. It is a cross-flow design and it bolts onto the Wrangler grille without mods.

It is possible to run a mechanical fan and they almost always have plenty of pulling power. Electric fans are more of the norm. We recommend our aggressive electric fan with integrated shroud assembly. These fans are controlled by any Ford computer equipped with a circuit to trigger a fan relay. Alternatively, you can install a fan control module and install it to our fan motor per the manufacturer's recommendations.

### **Exhaust**

If trying to use factory exhaust manifolds or aftermarket headers, they must clear the frame, body, steering, clutch release systems and the provided mounts. As such, we recommend aftermarket Novak's FF4 / FF5 series headers for compatibility as well as performance.

With these, you have the option to run the driver's side down and in front of the oil pan over to the passenger's side. Merge it and the passenger bank into a Y pipe and send it out as a single circuit down the passenger side, up over the axle out exiting at the rear.

### **Fuel System**

It is not only possible, but advantageous to use the factory Jeep fuel injection pump, should a future replacement ever be required. The Jeep fuel pump in 1991-2006 Wranglers is capable of natively producing ~100 PSI. This fuel



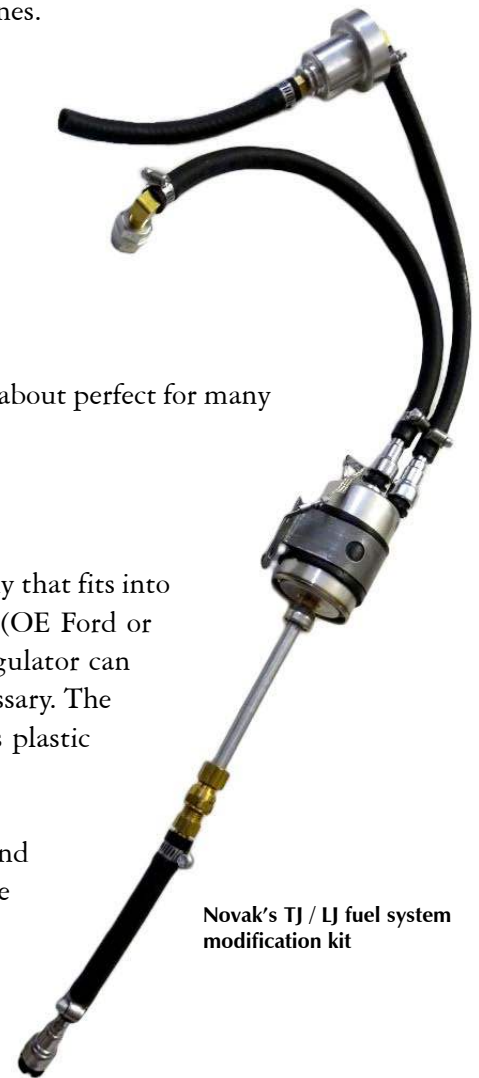
supply is, however regulated down to 40 - 45 PSI for the 2.5L & 4.0L engines.

For a little history and context, the 1991-1996 Jeep engine fuel rail featured a regulator. These systems have two connections: a high pressure supply connection and a low pressure return connection that feeds the bled fuel overage back into the fuel tank via a return line. In 1997, Jeep moved the regulator from the fuel rail into the fuel module in the fuel tank sending unit. This permitted the elimination of the return line from the engine back into the tank. Proper and regulated fuel pressure is achieved within the high pressure supply line. This is a simpler system in terms of manufacturing and reliability. This 40~45 PSI fuel pressure is just about perfect for many Ford fuel injected engines, but check your engine / injector requirements.

In 2005, Jeep bumped the fuel pressure from ~45 PSI to ~60 PSI.

If needed, Novak offers a fuel regulator bypass and bulkhead fitting assembly that fits into the Jeep fuel sending unit. The installer may then install a fuel regulator (OE Ford or aftermarket) that will set the proper pressure for their application. The regulator can be installed in proximity to the fuel tank so that a long return line is unnecessary. The installer will then drill and mount the bulkhead into the top of the Jeep's plastic fuel sender housing for a return circuit.

If you are using a carbureted Ford engine, you may wish to disassemble and change the OEM Jeep fuel pump to a low pressure aftermarket pump like an Airtex E3902, 17 PSI pump unit, and then regulate down to the more common ~5 PSI required for a carburetor. Alternatively, you can use a classic Ford mechanical on-engine fuel pump and pull through the existing Jeep fuel module.



### Throttle Linkage

If your engine has a cable throttle linkage, you can connect your Jeep pedal to the Ford throttle body. It may require an aftermarket, universal throttle cable. We have also had quite a bit of success using 1998-2001 Camaro throttle cables when a longer unit is required and the installer wishes to use an OE style part.

### Transfer Case Linkage

We cannot stress enough the advantages of replacing your Jeep's shifter with the Novak transfer case shifter assembly. This shifter kit has become very popular for both the conversion and non-conversion crowds, simply because of its vast improvement over the factory linkage. Its added benefit is that it makes the conversion process and typical transfer case relocation go much more smoothly. It is a very affordable upgrade and highly adjustable to your installation, whether using manual or automatic transmissions. Detailed instructions are supplied with this shifter kit.



If you must use the factory shifter assembly, you will need to lengthen or shorten linkage rods and relocate pivot and anchor points, taking into consideration the geometry required to actuate the New Process transfer case shifter plate.

### Transmission Shifters

If you're retaining your factory manual transmission, you will also retain your factory shifter cane and assembly. Instructions on how to best do this are included with your Novak engine to transmission adapter kit.

### Air Intake

Conversion air intakes have really evolved nicely. Typically, install a 4", 90 deg. elbow at the throttle body and point it towards the passenger side of the Jeep. You can then use a length of pipe, such as extruded aluminum and then a coupler to the Mass Airflow Sensor, which then connects to a cold-air style air filter assembly.

See the Novak air intake components page for assistance here.



### Conclusion

You should expect gaining significant power, fuel economy, reliability and general capabilities with your Ford to TJ Jeep conversion.

While reading through these instructions, and especially while performing the swap, it is often recognized that it is not the swap itself that provides the greatest difficulty, but in the ancillary things like linkages, 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 drivetrain conversions that cannot be anticipated.

### Disclaimer & Liability Limitations

The information contained in these instructions is for guidance only, and does not guarantee or constitute a warranty of fitness, applicability or compatibility with the customer's particular project. Suitability of parts or information for an application is fully the responsibility of the reader or buyer.

These instructions and the products and procedure described herein are offered only in accordance with the Novak policies and liability limitations found at:

<http://www.novak-adapt.com/about/policies.htm>



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.

