Introduction

Individuals have been successfully installing popular Chevrolet and GM engines to Jeep vehicles since the 1960's. The Jeep FSJ Wagoneers, Trucks and Cherokees have a fabulous history and are at the top of the pack for "cool" Jeeps for a conversion powertrain.

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 any product warranties.

About Your Engine Mounts

Novak's bolt-in / weld-in engine mounts for the SJ Jeeps provide immense strength and a rapid and precise GM V8 engine installation. We have sought to achieve the greatest ease of installation achievable with these phenomenal GM engines without compromising engineering.

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. Despite the larger engine bays and wide frames, there is actually a very narrow window in which these GM engines can properly fit into SJ Jeeps, and we've done this design legwork already. It was an enjoyable challenge to engineer a set of engine mounts that would put the GM engine in the right location, allowing for all the right steering, suspension, accessory, cooling, firewall and hood clearances required, and still be easily installed by installers with varying mechanical experience.

Compactness

The mounts keep themselves out of the way of the Jeep steering components, allowing the installer to keep the entire Jeep steering system operating as the factory intended. 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 possibly allow for axle housing or panhard bar (a questionably useful stability feature introduced in later SJ Jeeps) interference with some Gen. III+ oil pans. 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 vibration isolation, cushioning 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 SJ Information

By way of context, the Jeep SJ was innovately designed then released for 1962 as the progeny

to the reasonably popular Willys Utility Wagons and Trucks. These Jeeps (the Wagoneers, specifically) hold the record for the longest continuous production run (until 1991) of a vehicle without a significant change in appearance. And their enthusiasts would agree that such design and engineering excellence need not change.

Factory engines in these Jeeps included the 230 Tornado, 327 Vigilante, Buick 350, AMC I6 and AMC V8 engines. Some of these were pretty decent motors but all of them are relatively lackluster when compared to the outstanding power, efficiency, powerband, durability and driveability of GM's 1997+ Generation III+ powerplants. And, these installations present one of the most enjoyable vehicular mechanical conversion projects for the enthusiast.

These photos were taken moments before the beginning of a conversion.

So, out with the cluttered, overly complicated, underpowered uneconomical and onto to something quite different...

Preliminaries

Body & Suspension Lifts

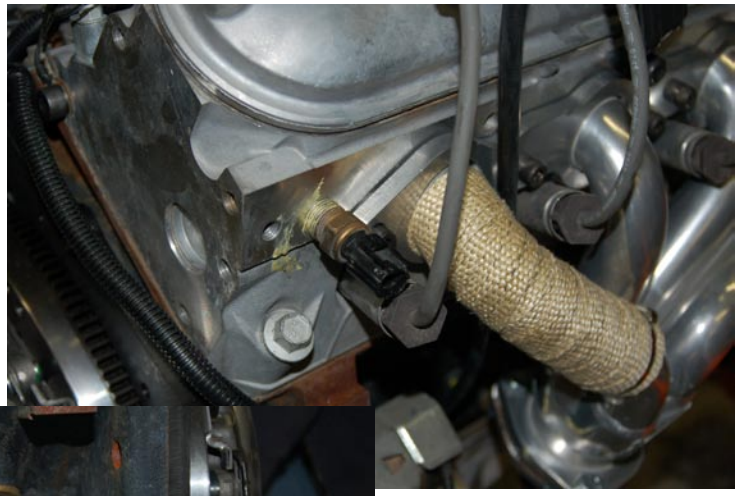
It is not necessary to install a body lift when installing a Chevrolet Small Block or GM Gen.III+ engine in an SJ. It is also not necessary to install a suspension lift or extended suspension snubbers for the purpose of the conversion. A GM V8 can be installed in a factory Jeep so long as original springs are not excessively fatigued or collapsed, and that bump stops provide an adequate front axle travel limitation vis a vis the oilpan.

Air Conditioning

The installer will use the factory AC compressor that is native to the GM engine being installed, and will then connect into the OEM or aftermarket HVAC system as per automotive cooling system standards. We do recommend this step be completed by an automotive cooling specialist.

Factory Electronic Modules & Gauges

The installer can retain all factory gauges, if desired. This includes the fuel level gauge, amp/volt gauge, water temperature, oil pressure, speedometer and tachometer. Use the factory engine's oil pressure and water temp sending

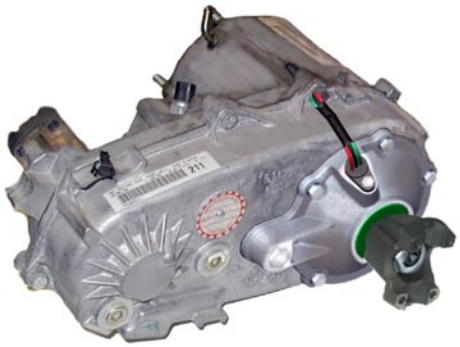


Shown in these images are pictures of a Jeep engine coolant temperature sensor (ECT) in the rear passenger head of a Gen III engine, and an oil pressure sensor threaded into the GM adapter on the oil filter assembly. These both feed into the Jeep gauges.

units in the GM block. Threaded adapters for these sensors are available if necessary through automotive parts sources and speed shops. The cable-driven mechanical speedometer can be connected to the original SJ transfer case (if it's being retained) or other upgraded Jeep transfer cases, such as the NP231, NP242, etc. It is also an option to change instrumentation to suit.

Jeep Transfer Cases

This guide is based on the retention of the Dana 20, or New Process 208, 219 or 229 transfer cases in your Jeep. It is also an option to install a Dana 18 in place of the QuadraTrac transfer case in some 1974-1979 Jeeps. Many of our customers are choosing to install the NP231 and NP242 transfer cases in 1980-1991 FSJ's. 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.



The Jeep NP231 is easy to find on salvage markets, they are affordable, have simpler shifter mechanism, and are surprisingly strong, especially when they have a heavy-duty mainshaft as found in good slip yoke eliminator kits.

Your Powertrain Assembly

If you have purchased a Novak Turn-Key powertrain, you can skip the following preliminary step.

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 gearboxes behind your GM 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 as 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 test 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.

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.

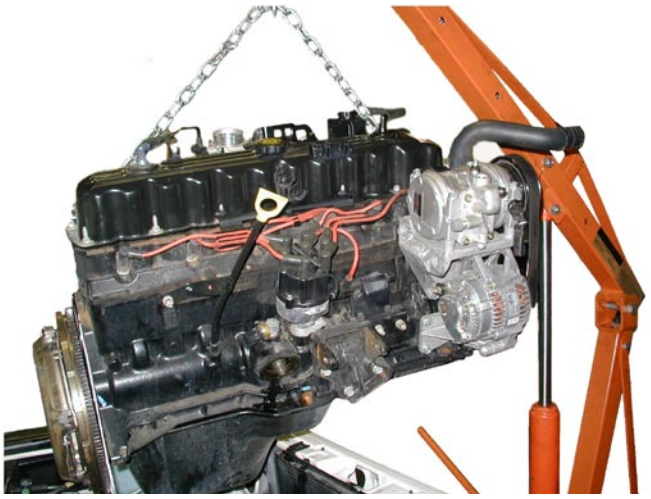
This section precedes the others in that it is a very good idea to have the powertrain assembled to the fullest extent possible prior to disabling your Jeep for the conversion process.

Begin the Conversion

As with all other Jeeps, we'll begin by disconnecting the negative battery cable and then the battery. Disconnect 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. We also recommend that you remove your heater unit to prevent damage as the powertains are removed / installed. Now, remove the grille fascia and the hood.

Powertrain Removal

It is highly recommended to remove not just the engine, but the transmission and transfer case, even if you are retaining both of them in your conversion. To do so, drop the crossmember / skidpan assembly, supporting the transmission and transfer case with jack stands. Disconnect the front and rear driveshafts and set them out of the way.



Drain the transfer case and the transmission fluids. On most models, you will replacing the full exhaust system and now is a good time to cut the exhaust just behind the manifolds to make space to remove other components.

Disconnect the transfer case shifter and speedometer connection. Remove the transfer case from the factory transmission adapter and set it aside. Disconnect the transmission shifter linkage, then remove the transmission from under the Jeep.

Safely secure a lifting jig to your outgoing motor and unbolt the factory engine mounts from the frame horns, then carefully pull

it from the bay. Having an assistant or two to guide it out is helpful.

Remove the factory engine mount frame horns by removing the through-frame 7/16" bolts and then cut (or fatigue bend 'til breaking) the top weld from the horn to the frame.

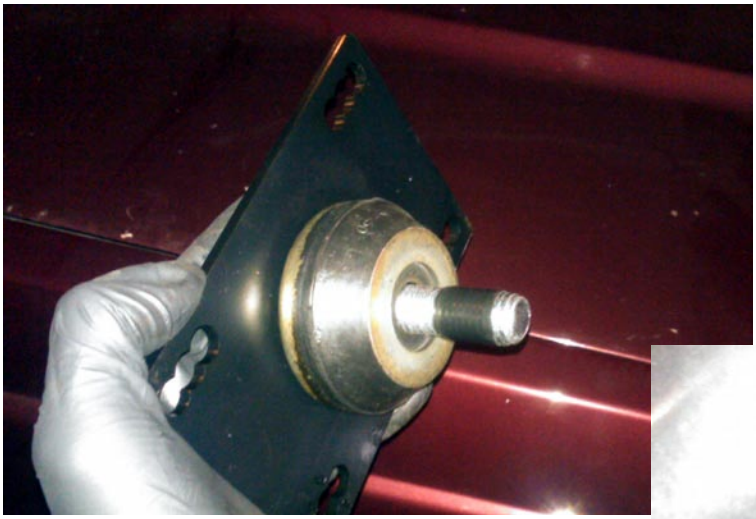
It's entirely too tempting to epoxy closed all the unutilized holes, sand, clean, prime and paint the engine bay while it is so accessible. This step will add a good couple of days to the conversion, but will add greatly to the pride and satisfaction in the job.

Engine Mounts

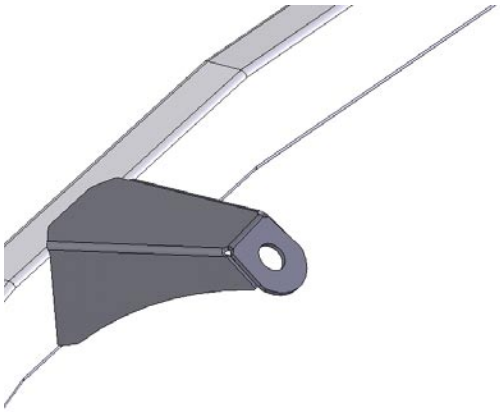
Engine Plate Installation

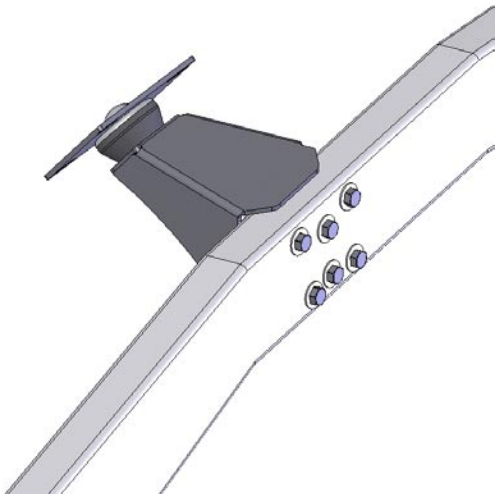
In preparation for any of the four versions listed below, mount the provided engine block mount plates onto the engine block bosses. Insert the provided carriage bolt through the center hole of the block plate.

Notice that these engine plates are adjustable fore and aft with three conjoined holes. We recommend you install them in the rear-most hole location at first, and then adjust forward if you have sufficient fan / radiator clearance. Use the eight factory or Novak-provided M10 (Gen III+) or 3/8" (Gen I-II) bolts. We recommend the installer use of a drop of removable thread locking compound on these threads, such as Loctite Blue upon final installation, and torque to ~38 ft. lbs.



Slide the upper isolator onto the carriage bolt, with the radiused cup side towards the engine block. Note that the engine plate hole is radiused to allow the carriage bolt to droop downward. This will ease your installation as the engine is lowered into the mounts. At this point, we recommend that you temporarily wrap the carriage bolt threads with two or three wraps of vinyl tape. This will help keep the upper isolator from sliding off during assembly.

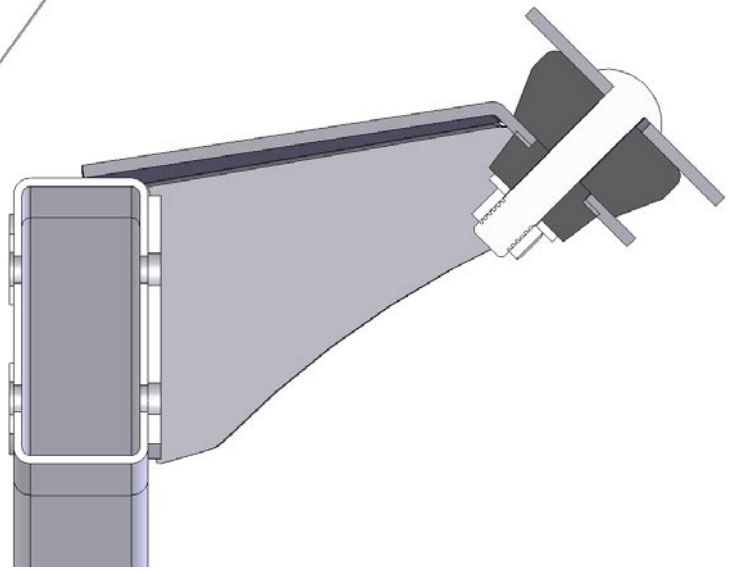




You'll notice that the Novak engine mounts will only bolt on in their proper left and right orientations. Unlike most other Jeeps, FSJ's require a Gen. III+ engine to be offset to the passenger's side, putting the shorter Novak platform on the passenger's side and the longer on the driver's.

Install the provided 3/8" bolts and washers through the frame and platform backing plate. Snug each bolt and then tighten them in two stages, sequentially and torque to 38 ft. lbs. The frame has captured sleeves which prevent the frame rail from crushing inward.

We recommend test fitting the engine and transmission for final verification. If you are satisfied with it, we recommend you lay a weld on the top edge of the mount where it meets the top of the frame rail, for maximum strength.



Install 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 and transmission 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 untouched in this conversion, excepting the connection of the GM power steering pump to the Jeep / GM Saginaw steering gear.

The GM power steering pump will drive the Jeep power steering gear perfectly well. Hose fittings vary and it is best to have a hydraulic shop help you form a proper high-pressure line with the fittings as appropriate. 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

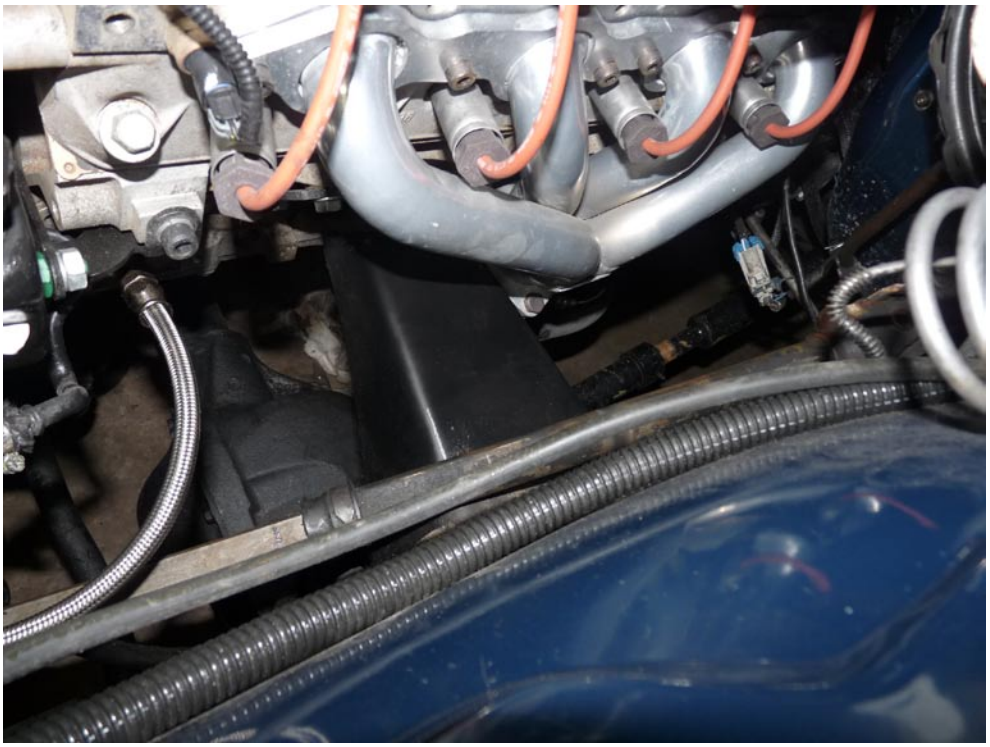
You can retain you factory braking system all together. No changes are necessary from the standpoint of the conversion itself.

The GM engine provides vacuum at the rear of the manifold,

Novak's Jeep Wagoneer engine mounts are ideal for Gen III+ engines, employing a bolt-in design for perfect placement and easy of assembly.

We do recommend that the top tab of the engine mount plateau be welded to the top of the frame rail (like the factory mounts were) for maximum strength.

whether it be a Small Block Chevy or a GM Gen.III+. It may be necessary to tap for a simple, barbed brass fitting on some manifolds that had the Hydroboost brakes.



Some late Grand Wagoneers may have featured ABS brakes. In this scenario, the ABS computer is separate from all systems and runs independently. No mechanical, wiring or hydraulic changes need to or should occur here.

Cooling System

The Jeep radiator does not have the necks in the proper locations for the GM engine conversion. These are large radiators and if they are capable of cooling a hot AMC 401, it will likely be able to cool a more efficient GM V8. The installer may choose to have the necks relocated by a radiator shop. Alternatively, and if more cooling capacity is desired, the Novak Radlock Radiator is a tough and very efficient radiator. It is a cross-flow design and it bolts onto the SJ grille without modifications.

Both the A/C condensor and transmission cooler are placed in the generous space in front of the radiator and behind the grille.

It is possible to run a mechanical fan and they almost always have plenty of pulling power. Electric fans are becoming more of the norm. We recommend our aggressive electric fan with integrated shroud assembly. These fans are controlled by any GM 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.

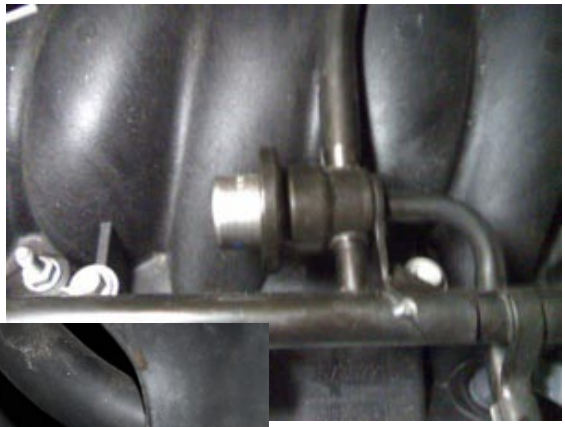
Exhaust

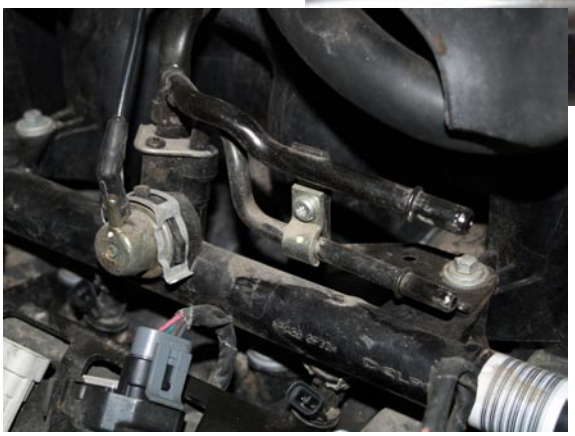
There are no known factory exhaust manifolds in the Chevrolet Small Block nor GM Gen. III+ line-ups that will work in a FSJ Jeep conversion, as they can interfere with the frame, body, steering, clutch release systems and even the provided mounts. As such, we recommend aftermarket headers for compatibility as well as performance.

FSJ Jeep exhaust systems are not difficult to run. We recommend our #CCLS1 headers for Gen.III+ engines. 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

The installer must pay special attention to safety during this phase of the conversion. Any person or shop working on any factory or conversion vehicle fuel system must consider that any open flame or electrical spark or tool spark in the proximity to fuel and especially fuel vapors can cause massive damage to life, health and property. Improper electrical connections can spark, overheat and ignite fuels and their vapors. If the installer is not qualified to work on a vehicle fuel system, they should seek the consulting and installation services of someone who is competent in this area.





Most GM Gen. III+ engines require a constant ~ 58 PSI to the fuel injectors. Consult a service manual pertaining to your engine's donor vehicle to verify this value. For proper fuel supply, electric pumps are the best and only plausible option. It is industry standard and best practice to specify a 90 - 100 PSI pump, and then regulate that pressure down to the pressure required by the injectors.

It is possible and simple to install an external, in-line, frame-mounted fuel pump and this method has been used by many installers. However, these pumps may have the following disadvantages, including their expense, operating noise and the fact that they are air-cooled in lieu of being fluid-cooled like the more common in-tank pumps. The rough anecdotal consensus seems to be that the inline pumps may not last as long as in-tank pumps.

In-tank fuel pumps are recommended for their quiet and reliable operation, in addition to conforming to automotive industry practices. We generally recommend this method.

Scenario I: Earlier Gen. III engines featured a fuel regulator at the fuel injection rail, as shown in the adjacent images. These engines can receive the standard 90 - 100 PSI provided by many OEM and aftermarket electric, in-tank fuel pumps. In this scenario, it is required that a fuel return line be be provided from the regulator at the engine, back to the tank.

Scenario II: Later GM engines do not feature a fuel regulator at the rail, therefore external fuel pressure regulation is required.

Novak has made available two fuel delivery kits for these Jeeps to assist the installer in this aspect of the conversion, either with or without a fuel regulator. Further instructions on this topic accompany these kits.

Geometry varies on GM throttles. This throttle-by-wire version one is steel, and we severed and welded it to be more ergonomic for the installation into this FSJ. Other GM versions are plastic, and can be tilted at their firewall bases with spacers to best angle them for the driver's comfort.

Installation of a TH400, 700R4 or 4L60E will place the crossmember in the rear set of frame holes. In the case of the 4L60E, the crossmember mount landed exactly on top of this Wagoneer's crossmember.

Throttle Linkage

If your engine has a cable throttle linkage, you can connect your Jeep pedal to the GM throttle body. However, the majority of GM engines now feature a "throttle by wire" or electronic throttle assembly. For these systems, you will need to install the GM electronic pedal assembly and its associated Throttle Actuator Control (TAC) module, if required. Note that most Gen. IV engines do not use a separate TAC module as this function is integrated into the Gen. IV powertrain computer itself.

Transfer Case Linkage

Usage of the factory transfer case shifter is possible for this conversion if the factory transfer case is retained. It will be necessary to adjust the shifter linkage to match the different location of the transfer case. If a different transfer case from factory is used, you may wish to consult a Novak technician about ideas and options here.

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. Instructions for GM automatic transmission shifters are included with your transfer case adapter assembly.

Note that it is easy to successfully retain the factory column shifter for automatic-to-automatic conversions. If you are installing a GM automatic overdrive transmission, you will require one more position in the column gear indicator. Aftermarket indicators are available for these Jeeps with GM steering columns. Consider the Ididit (TM) brand units, among others.

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.

Engine Height & Top Covers

Classic Small Block V8's and V6's have adequate clearance to the Jeep hood, and good clearance between the axle and suspension components. Generation III+ LS engines with their shorter intakes and shallower oil pans also have excellent suspension and hood clearance.

Generation III+ truck engines, however, are somewhat taller given their high-rise, torque increasing intake manifolds. In order to achieve maximum clearance at the bottom of the engine, we have engineered the mounts to put the engine higher towards the hood. This will probably necessitate the removal of the decorative Vortec manifold covers. This will gain the installer a needed about 1-1/2". To mitigate this problem and keep your conversion engine beautiful under your FSJ hood, Novak offers its decorative engine top cover in brushed, black-anodized aluminum and engraved with the Novak logo, as shown in the

adjacent image.

Conclusion

You should expect that you will gain significant power, fuel economy, reliability and general capabilities with your GM to FSJ 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.