

Introduction

We hope that the installation of your new Novak conversion engine mounts goes very smoothly and that you achieve the improved results with your Jeep® that you intend. This guide covers the principles of installing our side-type mounts in Jeeps with Chevrolet, Ford, Dodge and Buick "V" style engines.



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 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.

The installer will find these mounts to liberate the engine installation process, and the results of the swap will be superior. The 3/16" thick steel make them insusceptible to collapse under the forces of even the largest motors.

Engine Placement

About Driveshafts

First, let's discuss driveshafts. It is seldom a good idea to allow the driveshafts to make the decisions as to where the powertrain will be placed. Some of our customers, fearful at the perceived expense of new or modified driveshafts, attempt to let the existing driveshafts dictate engine, transmission and transfer case location, sometimes to the detriment of the project. Driveshaft modifications are usually inexpensive when performed by driveline, RV or tractor implement specialists. New driveshafts are an option but seldom a requirement in regards to the actual successful conversion. Jeeps that require extensive travel or specialty-built driveshafts have this option available through several fabricators across the nation.

Have the weight of the Jeep on the wheels when measuring the length to modify the drive shafts. Any changes in driveshaft length must be determined after the engine and transmission have been mounted. The Jeep must be sitting on the ground with its full weight on the wheels to make the best determination. If a shackle reversal has been or will be performed on the Jeep, it is crucial that you calculate the suspension geometry's effects on the front driveshaft. Shafts that are too long or do not have enough linear travel will cause



A GM LS1 in the bay of a Jeep

the driveshaft to ram your transfer case, causing damage to your axle, driveshaft, transfer case, adapter or transmission. Our experience has shown that some stock Jeep driveshafts are not quite the correct length from the factory to begin with. This can be corrected if the driveshafts are modified.

When doing a transmission and engine swap, driveshaft modifications can be kept to a minimum or, with some combinations, avoided entirely by moving the engine as far forward as space available allows. However, don't compromise the space needed by your cooling system just for the sake of driveshafts.

Mounting Location

One of the most interesting questions we've gotten over our company's 40 years is this one: *"Will you (or your instructions) tell me exactly where to put my engine into my Jeep?"*

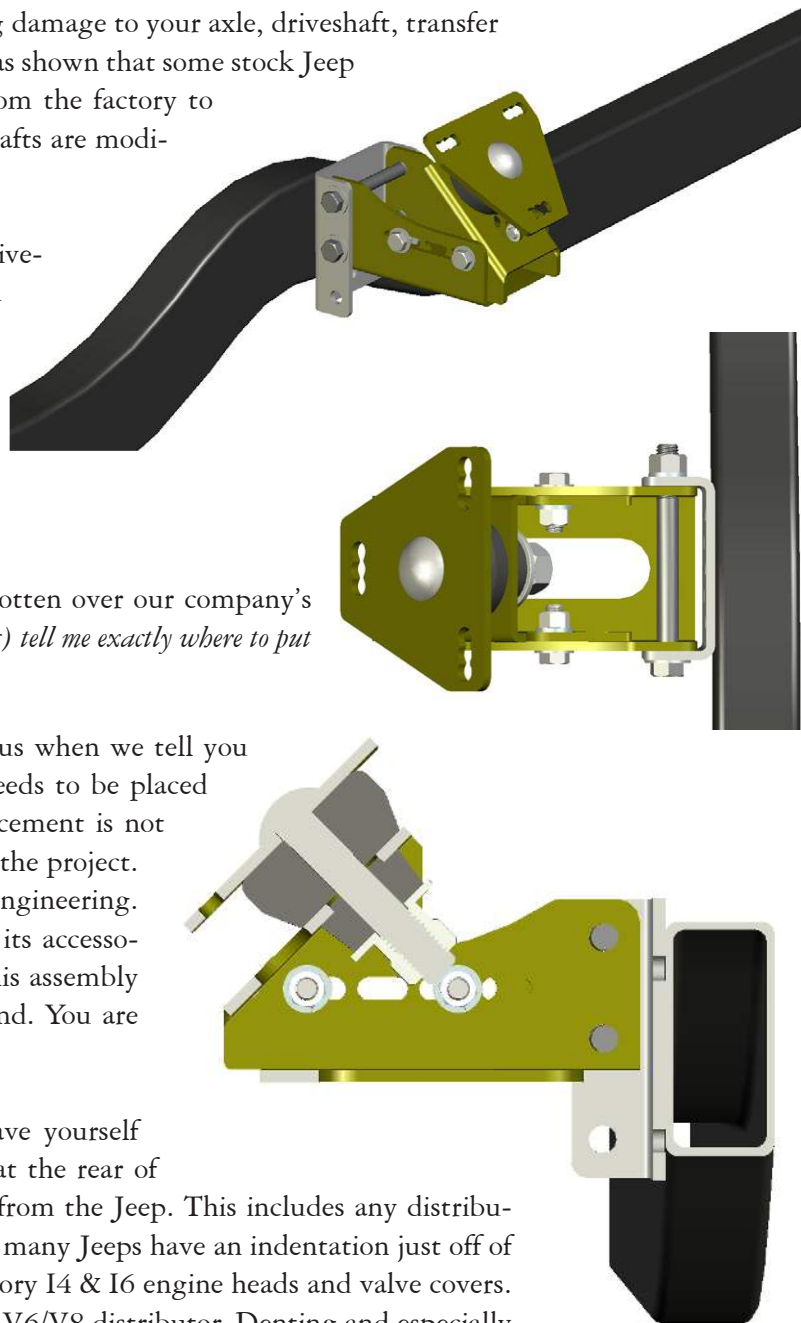
Our answer to this, in a word, is, "no." Trust us when we tell you that you will know where your new engine needs to be placed within your engine bay. Choosing optimal placement is not hard, and it is actually a very satisfying part of the project. The placement process works by top-down engineering. This consists of loading the engine with all of its accessories, including the exhaust manifolds. Lower this assembly into the engine bay and start nudging it around. You are looking for:

- **Firewall clearance;** a general rule is to leave yourself enough room that you can service the points at the rear of the engine without the removal of the engine from the Jeep. This includes any distributor, plugs, manifolds or sensors. Note here that many Jeeps have an indentation just off of center in the firewall for clearance with the factory I4 & I6 engine heads and valve covers. This is a very handy place to tuck a Chevy HEI V6/V8 distributor. Denting and especially cutting of the firewall looks quite terrible and will take away from the great look of your conversion.
- **Frame rail clearance;** it is usually exhaust manifolds that dictate location here.



- **Steering shaft clearance;** vis a vis the headers. This is more of a challenge with CJ Jeeps, and hardly a challenge at all with YJ and FSJ Jeeps.

- **Radiator clearance;** your choice of water pump and fan (mechanical or electric) will establish your envelope here. Shorter water pumps and electric fans offer the greatest clear-



What about shear?

In the design stages through to the first of these mounts sent to select customers, we got one consistent question: If the isolators are angled at 45 degrees (instead of the previous horizontal mounting), what keeps the weight and power of the engine from shearing them downwards?

The mounts, shouldering the engine at 45 degrees instead of level, are stronger in this orientation. Because the isolators are at 45 degrees, half the force of the engine is translated downward and half is translated sideways. Since the telescoping bracket is locked in both vertical and horizontal planes, the force on the isolators is transferred evenly.



ance. We find that placing the foremost part of the engine about 8-1/2" back from the radiator flange portion of the grille is often close to correct. You want about 1" of free space between the radiator and the engine fan. Mess with this envelope at your radiator's peril.

- **Hood clearance;** will the hood close without any (remember that engines twist under torque) interference? Choice of air cleaner and air induction tubing is also an issue here.
- **Front axle clearance;** will your axle, at maximum compression, threaten your oilpan? Most GM engines have rear sump pans. Ford and Dodge can be outfitted with rear sump pans.
- **Driveshaft to starter clearance;** vertical location is important for proper front driveshaft to starter clearance. Keep in

mind that the suspension height will change when the weight of the engine is placed on the frame. What appears to be sufficient engine to front differential and front drive shaft to starter clearance with the engine hanging on the hoist could be insufficient when engine weight is placed on the frame.

- **Engine / powertrain attitude (or tilt);** the engine should be tilted back by about 3 to 5 degrees from level.
- **Parallelism;** on all Jeeps, the engine and drivetrain should be parallel to the center line of the frame within 1/2" so that the powertrain will be parallel to the frame and perpendicular to the axles.
- **Offset;** Nearly all Jeeps from 1941-1986 have their original engines mounted offset towards the drivers side. The installer will install a conversion engine with more or less offset than this, as required by the various factors.

1. CJ Jeeps (1945-1986): 1-1/4" towards the driver's side
2. Utility Trucks & Wagons (1947-1964): 1 to 1-1/4" to the driver's side
3. YJ Jeeps, with their driver's side drop transfer cases and wide frames, accept the engine and drivetrain in the centered position quite readily, though minor offsets in either direction are ok if required.
4. FSJ Jeeps can have most engines installed on center, though a driver's side offset by 1" is more common.

It is critical that if you are installing an automatic transmission in a passenger-side drop transfer case Jeep, that you have at least 1-1/4" of drivetrain offset towards the drivers side. Failure to do so will cause transmission pan to front driveshaft interference.



The Procedure

You now know what you need to know. It is time to install.

Insert the 5/8" carriage bolt through the square hole in the provided engine block plate. Place the main, upper isolator over the bolt with its large face towards the block plate. Insert the bolt through the 45 degree angle plate on the inner telescoping bracket. Insert the lower isolator with the step oriented upwards. Seat this step into the angle plate. Follow up with the 5/8" washer. Lastly, thread on the load nut and finger tighten.

Now, bolt the engine block plate to the engine mount bosses on your engine. This may be two, three or even four bolts, depending on your engine. Use washers. Tighten these bolts to:



35 - 45 (oiled - dry) ft. lbs. for 3/8" or 10 MM bolts
55 - 70 (oiled - dry) ft. lbs for 7/16" bolts

Install the cradle bracket onto the inner telescoping bracket and loosely install the 3/8" bolts and washers to hold it together.

Gently lower your engine into the bay of your Jeep with your hoist / gantry / forklift / etc. Follow the placement rules as listed above. When you have narrowed down your target location, mock up the frame brackets to the cradle brackets and see where they land on your frame. You may want to temporarily use some short 7/16" bolts to allow for the jaw of your C-clamp to fit between the flange of this frame bracket.

The frame brackets can be "C" clamped to the frame and the weight of the engine can be put on the suspension for a vertical height check. If everything looks correct, lift the engine out.

The frame brackets can now be welded to the frame. It is a good idea to pre-heat the frame brackets and frame rails somewhat with a torch before applying the welds. Let the rails cool slowly to prevent hardening of the welds. Also, note that any fuel or fuel lines in the vicinity should be moved as far from the flame and welder as possible. If you fail to do this, you will potentially bring your project and your life to an unhappy halt!



C-clamping your bracket temporarily to the frame rail is an excellent way to establish the best location of the frame bracket (do NOT place yourself under the engine until the bracket is permanently installed).

Install the platform bracket in the middle set of frame bracket holes. Then, even after installation, you will have the option of moving your platform bracket up or down one set of holes for later adjustments, if necessary.

Final Assembly

Install the four 7/16" cross-bolts into the frame channel brackets and the cradle bracket. Insert the provided crush tubes between the outer bracket holes you intend to use, and feed the 7/16" bolts through them. Use the provided flat washers under the heads of the bolts and use the provided split-lock washers under the nut on each bolt. They will be torqued to ~55 ft. lbs. each. You will notice that the brackets will all sandwich together and close their gaps as you tighten.



Plug welds offer the best frame bracket attachment method.

You may also lay a horizontal bead along the top edge of the bracket. If the top edge of your frame bracket sits above your frame, lay a weld behind it, in the fillet of the frame rail.

A side weld along the edge of the bracket is fine, but don't run one the full height of the frame. Also, be sure to keep the weld profile as low as possible to avoid interference with the platform bracket.

At final assembly of the mounts, do not over-tighten the vertical 5/8" carriage bolts that go through the urethane insulator cushions. In fact, allow the upper bushing to compress with the normal weight of the engine.

Over-tightening will cause excessive engine-to-frame vibration as well as early failure of the cushions. Spin on the load nut on and tighten it.



Conclusion

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.

Novak Engine Mount Kits include:

Engine Block Plates (2)
Inner Telescoping Brackets (2)
Cradle Brackets (2)
Frame Brackets (2)
Urethane isolators, upper, encased (2)
Urethane isolators, lower, stepped (2)
Nuts, regular 5/8" (2)
Washers, flat, 5/8", (2)
Bolts, carriage, 5/8", Gr. 5 (2)
Bolts, hex, 7/16 (4)
Washers, flat, 7/16" (4)
Washers, split lock, 7/16 (4)
Bolts, hex, 3/8" (8)
Washers, flat, 3/8" (16)
Washers, split lock, 3/8" (8)
Instructions

We strongly suggest that you keep these instructions and the following, associated parts list for future reference. For questions concerning your conversion, contact the 4wd retailer or technician you bought the kit from, or if you bought your conversion kit directly from us, contact us and we'll be happy to answer your questions.



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.



Engine plate may vary from the one shown

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