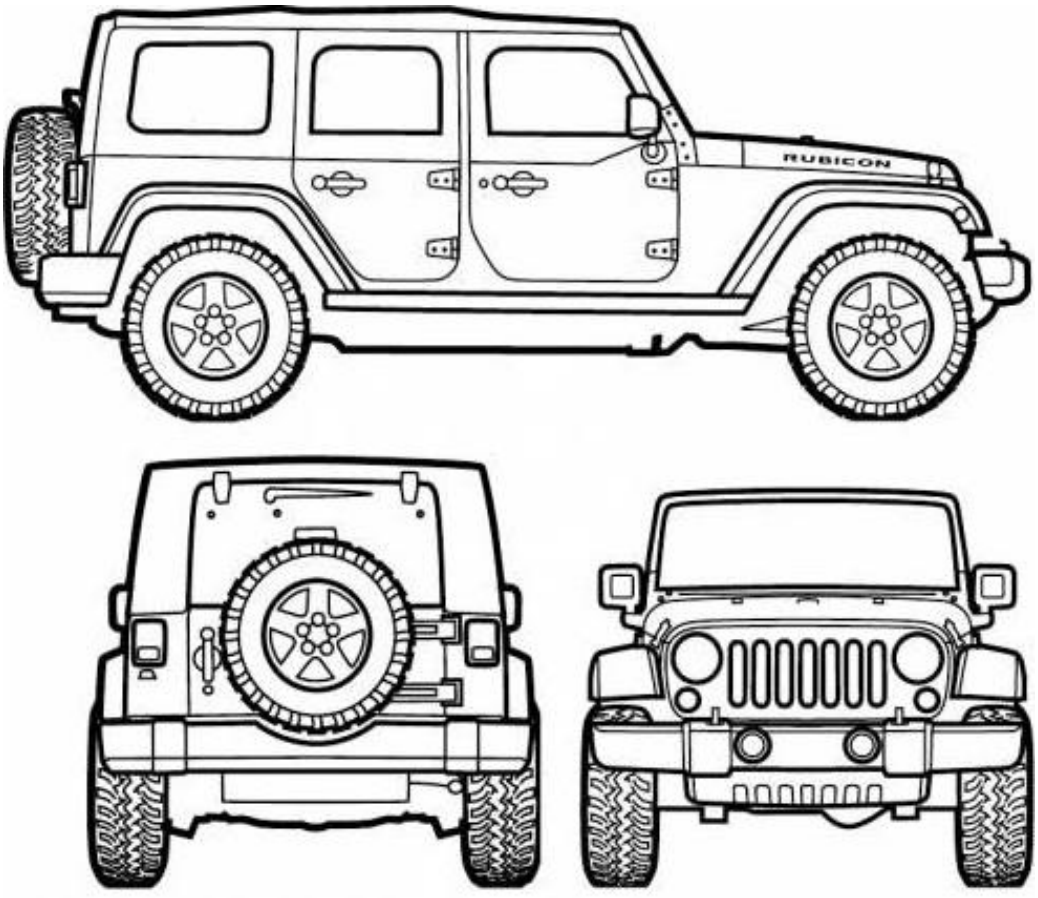
LS JK BUILDER KIT

2007-2011 Jeep Wrangler JK

Installation Guide



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Preface:

The Wrangler JK:

The Jeep Wrangler JK has become one of the most popular SUV's in the US and many other countries. There are many reasons the JK Wrangler has become so popular including the cost when compared to other similar vehicles. The JK wrangler can be had for one forth the cost of a Mercedes G-Wagon and half the cost of a Range Rover while still maintaining superior off-road capabilities. The full frame and live axle suspension makes the Wrangler JK tough for off-road use; however, through the use of modern coil spring suspension the JK maintains a decent on road ride.

A major attraction of the Wrangler JK is the availability of 4 doors which allows families to go off road together. In addition this extra room means the Wrangler JK can be used as an overlander or expedition vehicle. Whatever the reason over one million Wrangler JK's have been sold to date.

Body on frame construction is rugged but heavy. Add to this 2 axles (4WD), 4WD system (transfer case), federal crash protection and the average JK weighs over 5,000 pounds. It is not unusual for a JK to exceed 6,000 or even 7,000 pounds once armor, oversized tires, skid plates and other accessories are added.

3.8 engine:

From 2007-2011 Jeep installed the Chrysler Minivan 3.8 OHV engine in the Wrangler JK. While not a bad engine the 3.8 was somewhat overwhelmed in the heavy Wrangler JK. The 3.8 engine only has 202 HP which is not much for a vehicle which can weigh in excess of 2 tons. The manual 6 speed gearbox (NSG370) available with the 3.8 engine had decent gearing but could not make up for the 3.8's lack of torque. The 4 speed automatic (45RFE) gearbox added to the 3.8's inadequacy reducing its performance even further. The 4 speed automatic gearbox is old technology which generated considerable friction and heat and was not efficient in the heavy JK. It became apparent to JK owners that the stock 3.8 engine was marginal at best; and once weight was added with larger tires and armor the 3.8 could not keep up.

3.6 engine:

In 2012 Jeep replaced the OHV 3.8 engine with the new DOHC 3.6 Pentstar engine. The Pentstar engine was a big step up in technology and performance. The new engine was accompanied by a new automatic transmission for the JK, the 5 speed WA580. The 6 speed manual transmission remained an offering for the JK with the 3.6 engine. While the Pentstar engine increased horsepower to over 280 it remained a small displacement engine, smaller than the 3.8. Small displacement engines do not handle heavy loads as well as the larger displacement engines do due to the inherent torque. Torque is what it is all about when it comes to moving a heavy vehicle efficiently. Superchargers and Turbocharges can increase a small engines output as we will discuss later. Overall the 3.6 DOHC engine did a better job at hauling the JK around and if the JK did not have extensive modifications the owners were generally happy. Early Pentstar engines (2012-13) had cylinder head issues with many associated recalls so these JK's make good candidates for a V8 swap. The WA580 transmission added better gearing for the 3.6 JK. The WA580 can be bump shifted giving better control both on and off road. Jeep upgraded the transmission cooler in the automatic 3.6 JK's which was badly needed. A vacuum pump was added to the brake system in the 3.6 JK's to deal with the small displacement engine working hard and reducing intake manifold vacuum, hence braking performance.

As far as the swap is concerned there is not much difference between the 3.8 and 3.6 swaps, a little bit of hardware and software differences. This manual will cover the 3.8 JK and the 3.6 will be covered in a separate manual.

Part 1

Power options:
Jeepers have been in a constant search to add power to their underpowered JK's. What it really comes down to is cost vs performance. Many JK owners cannot afford a V8 swap so they choose other power options:
Cold air intakes are not of much use unless accompanied by other mods such as tuning and exhaust in our opinion.
Chipping or tuning the 3.8 engine can add power but sometimes at the cost of reliability and drivability. If you choose to run a custom tune in your JK be aware of engine knock and run the appropriate fuel. Monitor your transmission temperatures and slippage as damage can result if tuned improperly. As with most modern engines Chrysler has got maximum performance out of the powertrain while considering drivability, reliability and longevity as well as emissions compliance. In order to gain somewhere usually you have to lose somewhere else.
Supercharging is considered a viable power adder for the 3.8 engine by many. There are several concerns and considerations when supercharging.
In general Chrysler runs calculated airflow in their operating systems (speed density). This means actual airflow is not measured and used for fuel delivery; rather, look up tables are employed to mimic what airflow is expected to be. Environmental conditions such as altitude, humidity and temperature can affect airflow readings. In extreme cases going from low altitude to high altitude during the same ignition cycle can affect fuel delivery based on inaccurate air density projections.
Some vehicles run a separate barometer and MAP sensor so air density can be determined regardless of altitude with the engine running; however the JK does not do this. The JK gets a baro reading at key on engine off and that value is used for baro calculations. While this is tolerable for the most part in a 1 bar stock operating system it can be troublesome with forced induction engines. Since the 3.8 engine is designed as a normally aspirated engine it uses a 1 bar operating system, this would be approximately 100-0 kpa. When a supercharged engine passes from atmospheric pressure into boost many things change which the 1 bar operating system does not handle well. Some operating systems, including the LS/LT engines use an actual airflow meter called a MAF (Mass Air Flow) sensor. This MAF sensor supply's the ECM with actual airflow data to base fuel delivery on. Using actual airflow means environmental influences such as temperature, moisture and altitude can be taken into account. Gen V GM LT MAF sensors incorporate a humidity sensor for a more precision measurement. When running without a MAF sensor such as the 3.8/3.6 engines, means there is a fine balance between an engine the runs properly and one that does not.Calculated airflow tables are based on several coefficients, engine RPM, intake manifold vacuum (MAP) and other various parameters. Intake manifold vacuum is critical in a speed density operating system. Engine load is determined by intake manifold vacuum as measured by the MAP (Manifold Absolute Pressure) sensor. This MAP data is used not only for engine performance but also for transmission control. Chrysler is heavily reliant on torque management to control their transmissions so critical MAP readings must be accurate or unstable shifting and transmission damage can be the result. For this reason a manual transmission JK lends itself better to supercharging.
Running a boosted engine off a one bar operating system means drivability usually suffers. Cruise control surging, flat spots, non-linear throttle response can lead to a disappointing driving experience with a supercharger. How well a supercharged engine runs comes down to the tune and set up. Some supercharged installs run much better than others but in general cannot compete with the pure drivability of a V8 engine.

There are two major types of superchargers, centrifugal and roots style, both driven by the crankshaft. Each have their advantages and disadvantages and the debate will go on which performs better but both are trying to mimic the behavior of a larger displacement engine.

Turbocharging has much in common with supercharging with basically similar benefits. The difference is turbocharging uses exhaust gas to drive an impeller which spins the turbine which pressurizes the intake air. Turbochargers usually run at high temperatures so extra caution is needed for a proper install. Water cooled turbochargers are becoming popular but add complexity. Both superchargers and turbochargers will stress the engine components beyond what the manufacturer intended. Going with conservative boost means less horsepower but a longer lasting engine and better drivability; turn up the boost too much and you may damage your engine. Intercoolers can cool down intake air which increases power and reduces stress. Intercoolers can be air to air or water to air and are usually installed in front of the AC condenser where they block airflow to the radiator. Plumbing the intercooler usually means cutting or drilling the core support to fit it properly.

Hemi engines are considered by many as the best performance option for the JK. There are many reasons for this belief mostly based on the fact the Hemi and JK are both Chrysler products. For this reason only one ECM is required and wiring simplified. If you look closer at the Hemi swap as we did it becomes apparent the Hemi has it's positives but also many negatives in a JK.

To start the Hemi is a large engine and the JK has a small engine compartment. Fitting a Hemi into a JK usually requires cutting the firewall to relocate the steering shaft for clearance, removing the battery tray and turning the battery sideways (2007-2011) and on some installs hammering the firewall to get the engine back as far as possible. Add to this the Hemi is a heavy engine with an iron block so suspension mods are usually in order accompanied by a JK that handles different.

The electronic side of a Hemi swap can also be a concern. Most Hemi swaps start off with a 3.8 calibration and patch or hack in a V8 segment. While this may get the engine running it causes several other concerns. For emissions compliance OBD II mode 6 data is used to run and set monitors and since the hacked 3.8 OS is not pure this usually means the monitors will not run and set as intended. In addition the USEPA requires the calibrations remain pure and not hacked which most Hemi tunes are.

The Hemi being a large iron engine in a relatively small engine compartment can also be difficult to cool; large radiators and powerful fans are required to keep the Hemi cool.

Hybrid conversions have also been used in the JK. Realizing the benefit of the LS engine, but the desire to stay with a single ECM, led to the LS JK hybrid swap. Installing an LS engine into a Chrysler operating system. While on the surface this seems like an elegant solution there is a lot to consider. Getting the LS to run inside a Chrysler operating system and mate to a Chrysler transmission requires specialized adapters, calibrations and bespoke components that are not readily available. Add to this there is usually drivability concerns due to the complexity of integrating a GM engine and Chrysler transmission. As far as emissions compliance hybrids such as this are not compliant.

Diesel engines have promise in the JK. The issue with a diesel engine in the JK has been the availably of a suitable engine; an engine that is USEPA compliant and the proper size and weight for the JK chassis. Recent diesel offerings such as the VM Motroni 3.0 and GM 2.8 Duramax fit the bill and MoTech will be pursuing a diesel swap in 2017.

Part 2

The LS JK:
In 2008 it became apparent there had to be a better solution for the JK power problem. An engine that was compact, lightweight, powerful and compliant was required. The solution was already there in GM's LS series of engines. The advantages of the LS are cost, reliability, size, efficiency, cooling, weight, availability and a lot more. Performance enthusiasts from Baja to Nuremburg understand the performance potential of the GM LS engine.
MoTech pioneered the LS JK swap in 2008-9, the goal was a fully integrated and functional conversion that was rugged and emissions compliant. This meant using standard GM hardware, software and calibrations. Doing a cross manufacturer swap can be challenging and it was. From the beginning we had virtually full functionality; however, the interface was complex and time consuming to install.
Fast forward 8 years and through the use of simple electronics and CAN bridge technology the new MoTech LS JK install rivals the ease of almost any other engine conversion including the Hemi. Using production controllers, hardware, software and network configurations ensures emissions compliance where required. We will discuss emissions later as it can depend on the jurisdiction you intend to register your JK.
In our opinion there is no comparison between the LS and the previously mentioned power options. The modern LS/LT when equipped with advanced GM 6 and 8 speed transmissions simply make the JK a pleasure to drive in any condition. With roughly the same weight as a stock JK, adequate cooling and virtually OE functionality the LS JK is in a league of its own in our opinion. Off road, highway driving or in traffic the LS is at home. The LS is a very docile engine but powerful at the same time unlike other power adders which sacrifice drivability.

Part 3 LS Engines

This manual will concentrate on the Gen IV engines, the Gen V engines will be covered separately. The Gen IV LS engines are a good fit for the JK for many reasons:

Gen IV LS engine benefits:

- Emissions compliance. The JK was introduced in 2007 and the Gen IV engines went into full production by GM in 2007. For this reason we no longer support Gen III LS engines in the JK. We can help you with hardware but the Gen III and IV electronics are not compatible.
- Gen IV LS engines introduced variable valve timing which helps bottom end torque to move a heavy vehicle. Not all Gen IV engines run VVT and in general VVT engine run slightly lower compression ratios.
- Gen IV LS engines introduced AFM/DOD which is a 4 cylinder mode. Running on 4 cylinders can save gas in a light JK but we have found does not do much for a heavy JK.
- GM introduced the CAN driven transmission with the Gen IV LS. The 6l80 is a huge benefit in the LS JK swap and contributes almost as much as the engine to the conversion. The 6l80 has a 4:1 first gear to launch hard but has a .6 overdrive to cruise on the highway. The 6l80 is low friction, low heat and clutch to cutch for quick shifts.

Let's: look at the Gen IV LS engines that work well in a JK:

Truck/SUV

Year	Size	Code	Block	VVT	AFM	Flex Fuel	6l80	Recommend	Gas
2007-8	5.3	LY5	Iron	No	Yes	No	No	No	Regular
2007-8	5.3	LMG	Iron	No	Yes	Yes	No	No	Regular
2007-8	5.3	LH6	Aluminum	No	Yes	No	No	No	Regular
2007-8	5.3	LC9	Aluminum	No*	Yes	Yes	No	No	Regular
2007-8	6.0	LY6	Iron	Yes	No	No	No	No	Regular
2007-8	6.2	L92	Aluminum	Yes	No	No	Yes	No	Premium
2009	5.3	LY5	Iron	Yes	Yes	No	Option	No	Regular
2009	5.3	LMG	Iron	Yes	Yes	Yes	Option	No	Regular
2009	5.3	LH6	Aluminum	Yes	Yes	No	Option	No	Premium
2009	6.0	LY6	Iron	Yes	No	No	6l90	Yes	Regular
2009-13	6.2	L9H	Aluminum	Yes	No	No	Yes	Yes	Premium
2010-14	5.3	LMG	Iron	Yes	Yes	Yes	Yes	Yes	Regular
2010-14	5.3	LC9	Aluminum	Yes	Yes	Yes	Yes	Yes	Regular
2010-16	6.0	L96	Iron	Yes	No	Yes	6l90	Yes	Regular
2010-14	6.2	L94	Aluminum	Yes	Yes	Yes	Yes	Yes	Premium

*Some early LC9's came equipped with VVT.

LS3/L99 Camaro

Year	Size	Code	Block	VVT	AFM	Flex Fuel	6l80	Recommend	Gas
2010-15	6.2	LS3	Aluminum	No	No	No	Manual	Yes	Premium
2010-15	6.2	L99	Aluminum	Yes	Yes	Yes	Yes	Yes	Premium

Real life considerations:

- **6.2 engines should run Dexose Mobil 1 or equivalent.**
- **5.3 and 6.0 engines can run conventional, semi-synthetic or synthetic oil.**
- **5.3 and 6.0 engines will run on low grade fuel.**
- **Avoid running a 6.2, especially an LS3 on low grade fuel.**
- **5.3 and 6.0 engines are plentiful and inexpensive.**
- **6.2 engines are in high demand and cost more.**
- **6.0 engines come with 6l90 transmissions.**

We will discuss each engine in detail since the proper engine choice is critical for a proper swap. A light JK in Florida near sea level has a very different need than a heavy JK in Colorado. In addition **IT IS CRITICAL TO MATCH YOUR 6l80 TRANSMISSION TO YOUR ENGINE**. We emphasize this since it is a common mistake to mate non compatible engines and transmissions together. We will discuss this in more detail later.

5.3 engines are great, they put out good power, run smooth, are low cost and last for hundreds of thousands of miles. 5.3 engines are available in both iron and aluminum blocks and can run low grade gas. The iron 5.3 engine weighs about 55 pounds more than the all-aluminum 5.3 so you may need a 1-2" budget boost in the front to level your JK. The extra weight is marginal when compares to a 100 pond winch on the bumper, most of the 5.3 weight is behind the axle and down low. We find the iron 5.3's work great and are a good low cost engine for your JK.

5.3 issues. The 5.3 engine is only 1.5 liters larger than the stock 3.8 engine, this means the 5.3 does not have the inherent torque of the 6.0 or 6.2 engines. Even though the 5.3 is over 300 HP it's torque that moves your heavy JK efficiently. In a light JK the 5.3 is perfect. A light JK means plastic fenders and bumpers and 35" or smaller tires. If you live in an area where there are few mountains and mostly drive around town with little highway then the 5.3 is okay in a heavy JK. If you live in Colorado at high altitude and travel on mountain passes do yourself a favor and get a larger displacement engine. The 5.3 will pull your heavy JK up the passes but it will downshift and go into performance enrichment. Downshifting increases engine rpm to get the engine into a better power band but this does use more gas. Performance enrichment is an open loop mode that ignores the oxygen sensors and adds more fuel to the engine due to high load demand. This means your air fuel ratio can go from 14:1 to 12:1. Bottom line is the 5.3 is working harder due to its smaller displacement and in the end is less efficient in a heavy vehicle under a load. On the flip side if your JK is light and not lifted you can expect good economy with the 5.3 engine. The 5.3 is also an excellent engine for general off-roading or around town driving. If you tow your JK to the trail or mostly drive on the streets the 5.3 will work in a heavy JK, even with 40's. The 5.3 will tow a very light trailer with ease but the 6.0 engine is preferred.

The 6.0 engine is what Jeep should have installed in the JK from the factory. The 6.0 is a perfect balance of economy, cost and performance in a JK. 6.0 engines come from HD trucks such as the 2500-3500 series Silverado's, Sierra's, Express Van's and cab chassis. Basically if you got a 2500-3500 GM HD truck with a gas engine you most likely got a 6.0 engine. The 6.0 engines use VVT and have great low end torque, more than some 6.2's. From GM the 6.0 tunes are very conservative to live in work trucks that are not well maintained and run hard. To get the most out of the 6.0 engine some tuning is recommended and we can help you with that.

The 6.0 engine is as durable and reliable as they come, the iron block can handle hot and cold environments and the 6.0 will burn about any gas you can put into it. Combine this with the availability and low cost of the 6.0 engine and it is a perfect match for the JK. The 6.0 HD engines have a few differences from the ½ ton LS truck engines. The 6.0 engines come with a 6l90 transmission, the 6l90 transmission is the HD version of the 6l80 transmission but not required in a JK We will discuss more about this later.

Another consideration of the 6.0 is emissions compliance. Since the 6.0 is from a higher GVWR than the JK it may not be compliant in the JK in your jurisdiction. Our preferred 6.0 engine is the 2010+ L96 mainly for the ease of programming. The 2009 Ly6 works well if you have a 2009 6l80/90 transmission. Many 6.0's came with the 4l80 transmission prior to 2009.

6.2 engines are all aluminum and over 400 HP. The 6.2 engines are derived from the performance LS3 high compression Corvette engine. The 6.2 engine turns your JK into a muscle car but maintains excellent drivability. The only downside to the 6.2 is cost, a low mileage 6.2 will cost double a 5.3 or 6.0 engine. In addition the 6.2 engines prefer premium gas and synthetic oil.
The 6.2 engines are available in basically two variants, the truck/SUV and passenger car. The main difference is the intake manifold which is taller for more torque in the truck engines. The cam timing is different between the truck and passenger car engines with the truck being tuned foe low to mid-range power and the passenger car mid to top end power. We have run all the Gen IV 6.2's and in daily driving you will not notice much of a difference.
All truck 6.2's have VVT and aluminum blocks. Some truck 6.2 engines have AFM and Flex Fuel but in the end they all make a great engine in the JK. Stay away from the 2007-8 engines if possible due to the OS complexity.
The passenger car 6.2's has two variants, the LS3 and the L99. The LS3 is installed in manual transmission Camaro's and Corvettes and does not run VVT or AFM, it is a simple performance engine. The L99 is the automatic version of the LS3 and it is equipped with VVT and AFM. Either the LS3 or L99 make great engines in a JK.

Part 4 Operating Systems

Operating systems are specific to each engine – transmission combination. We will give you general guidelines when choosing an engine and transmission:

- **2007-8** ECM's and TCM's are mostly compatible. For various reasons we suggest you do not purchase a 2007-8 engine and transmission. The 6l80 was mostly used in high end L92 6.2 engine in Escalades and Denali's in 2007-8. The 5.3 and most 6.0 did not use the 6l80 or 90 in 2007-8 and you **DO NOT** want to mix and match a 2007-8 engine with a later model transmission and vice versa. 2007-8 operating systems used a Delco MAP sensor which uses a different calibration, intake manifold, injectors, fuel rail……. The 2007-8 ECM and TCM's can be difficult to program and may require additional steps to run properly. MoTech helped eliminate VATS on early 2007-8 ECM's including the starter relay check. In some cases the starter relay delete will not take on 2007-8 operating systems and you must run a resistor to mimic the starter relay trigger. Many 2007-8 TCM's use an ignition voltage supply check, if the proper voltage is not sensed the transmission will go into a limp mode after one ignition cycle. The code causing this limp mode can be removed with EFI Live so it has no effect; or, a transmission power relay can be installed please call for details. As mentioned the 2007-8 LS engines use a different MAP sensor and connector as well as the small oil pressure sensor so if you are running a 2007-8 engine – transmission you may have to swap these connectors call for details. In general stay away from 2007-8 LS engines and transmissions.

- **2009** was a year all on its own. In 2009 GM changed the MAP sensor over to a Bosch style which they kept until 2016. The most important thing about 2009 engines and transmissions is they run a bespoke ECM and TCM. So while GM updated the hardware in 2009 to be essentially the same as 2010 and above they used a one year only ECM and TCM. This means if you have a 2009 engine you want to get a 2009 transmission and ECM. There are exceptions but overall if you go with a 2009 engine get a 2009 transmission and ECM.
- **2010 up.** GM finally standardized the ECM's, TCM's and hardware in 2010. This means Gen IV 2010, 2011, 2012, 2013, 2014, 2015 and 2016 ECM's and TCM's are compatible. In addition the operating systems and calibrations were standardized so

there is great interchangeability and easy tuning for 2010+ modules. This means you can purchase a 2010 engine and a 2016 6l80 with no worries. You can purchase a 2011 L96 6.0 and a 2014 5.3 6l80 again with no worries as they are compatible. We urge you to purchase a 2010+ powertrain for these reasons.

We should mention a little bit about the Gen IV controllers at this point. With the Gen III LS engines GM ran a PCM (powertrain control module), the PCM controlled both the engine and transmission. This meant there were a lot of wires running between the PCM and the transmission to control solenoids, PRNDL, etc. With the advent of CAN (Controller Area Network) GM separated the ECM and TCM in the Gen IV operating systems. The Gen IV ECM now only controlled the engine and the transmission was controlled by a separate TCM; the ECM communicated with the TCM over the CAN. Using transmissions like the 6l80 and 90 meant only a few wires had to be run to the internal TCM - power ground, CAN in and out, brake switch… Gone were the dozens of wires that controlled the valve body. When running a non CAN transmission with a Gen IV engine, such as the 4l65, a standalone TCM (T42) was used to interface the transmission and ECM. This arrangement was a step towards the CAN transmission as all the wires that were present in the Gen III PCM to transmission were present between the TCM and transmission, and in addition the wires from the TCM to the ECM. This is another reason we do not like to run the 4 speed automatics with Gen IV operating systems.

Part 5 Gen IV LS Engine Features

Most LS Gen IV engines share the same architecture. The main difference is block material – aluminum or iron, VVT, AFM, Flex Fuel and displacement. We find the performance - economy difference is small regardless of which configuration you choose. AFM will only add a small mpg increase in a light JK. VVT has a little more bottom end but non VVT engines have more compression so it evens out over the whole power band. North American JK's do not use Flex Fuel so it is not an important option. Bottom line is get the best value in an engine you can afford. If you find a good deal on a low mileage L9H vs a high mileage L94 get the L9H it is a great engine and the differences are small.

AFM or air fuel management is a gas saving 4 cylinder mode. AFM was previously known as DOD – Displacement On Demand. By hydraulically disabling the lifters AFM turns a V8 engine into a V4. The advantages of a V4 engine is the reduction of pumping losses. Pumping losses are due to an IC engine running at less than WOT creating drag the engine must overcome. By disabling 4 cylinders and essentially turning them into air springs pumping losses are reduced and economy improved. In the real world AFM is only effective in light vehicles with small tires. The reason is when you reduce engine displacement in half you lose most of your torque and in a heavy JK with large tires you will not be in AFM mode often. AFM is most effective at very light cruise and in cruise control, any load applied will kick you out of AFM. Letting off the throttle will put you into DFCO-deceleration fuel cut off so AFM has no benefit there. In a light JK when driven properly AFM can give you a few percent better mpg, but some find the sound and vibration associated with AFM annoying. We can turn AFM on or off for you if your engine is so equipped.

Flex Fuel is the ability to use a high percentage of alcohol. We do not recommend using E85 or an alcohol content much more than 10% in your JK as the JK fuel system is not set up for it. Flex Fuel JK's were sold in Europe and are equipped with a green fuel filler assembly to identify them as Flex Fuel vehicles. Some LS engines such as the LC8 are designed for multiple fuels. The LC8 can run on E85, alcohol, natural gas and propane. The main difference between the LC8 and L96 is the LC8 uses non corrosive internals to handle the alternate fuels. Even if you have an alternate fuel engine we suggest you only run on gasoline since that is what your JK is designed for. Interesting fact: modern OS's use virtual sensors to determine the stoichiometric point of the fuel (1.5% O2) so costly hardware sensors are no longer required.

VVT- Variable Valve Timing is a way to increase the power band of an engine. In order for an engine to idle well and perform stable at lower rpm's a conservative cam profile is desired. Increasing the cam profile will increase power in the upper rpm range but at the expense of lower rpm stability and idle quality. Once the cam profile keeps the intake valve open after bottom dead center the intake charge is pushed back up into the intake at low rpm causing turbulence and rough running at idle and low rpm. On the other hand if the cam is too conservative power output suffers. The solution is to phase the cam to get good low rpm performance then retard the cam in the upper rpm range for more power. Gen IV LS engines phases a single cam which cannot move the intake and exhaust lobes independently; and the phasing is discrete which means the cam has only two positons, parked and open. While not as good as CVVT – Continuous VVT, discrete VVT is beneficial to get more low end torque and top end power. You may notice (especially with the 6.0 engines) a distinct power surge at about 4,000 rpm as the cam phases, this is normal and should not be tuned out. In general GM has lowered the compression ratio on VVT engines, this is to limit high cylinder pressures which could cause detonation or engine damage. Motech tested the non VVT LH6 and VVT LC9 5.3 engines and find they perform very similar. The additional compression of the LH6 seems to match the lower compression but VVT of the LC9. The VVT engine may have a little more bottom end torque while the non VVT engine is a little smoother through the power band. Same holds true for the LS3-L99 6.2 engines.

Part 6 Transmissions

The 6l80 offers diverse gearing ranging from a 4:1 first gear to a .60 overdrive. MoTech's Gen IV LS JK kit is designed around the GM 6l80 transmission. The 6l80 is a modern clutch to clutch, adaptive, low friction, low heat transmission. This diverse gearing allows a heavy JK to launch hard but still run low rpm's on the highway. With the availability of the CAN 6 speed transmissions the old technology 4 speed transmissions make no sense in a JK. The 6l80 is very strong and incorporates the TCM (transmission control module) inside the valve body. Having the TCM internal to the transmission mean only a few wires need to go to the transmission cleaning up the harness. Solenoid control, IMS (internal mode switch) and PRNDL functions are all internal to the 6l80 and transmitted over the can bus. The 6l80 runs a large 32 spline output shaft similar to the 4l80. This output shaft is good for 500 HP unlike the smaller 29 spline output shaft the JK runs. Using our transfer case adapter we replace the weak 29 spline input from your JK 241J (not 241 OR) to accept the HD output of the 6l80, more on this later.

GM installed the HD version of the 6l80 into the ¾ and 1 ton trucks, the 6l90. In general the 6l90 is a 6l80 with stronger parts and a larger output shaft. The 6l90 output shaft will support the 1 ton transfer cases but it is highly not recommended. If you want to run a 6l90 we suggest you purchase an Atlas II from Advance Adapters. It is important if you want to run a 6l90 you get a 4WD 6l90, the 2WD 6l90 has a different output shaft spline which is not supported by MoTech or Advance Adapters.

There is a 241j to 6l90 input gear available from Novak adapters, these work well but may require a spacer ring between the transfer case and adapter if your 6l90 has short splines. One final note: the 6l90 is about 1 ½" longer than the 6l80. The 6l80 is shorter than the 4l60 transmission but taller. In a 2 door JK if you run a 6l90 the driveshaft length will be reduced and if your 2 door JK has a 3" or higher lift pinion angle will suffer and may result in a driveline vibration. We suggest you stick with a 6l80 if possible with all Gen IV LS engines.

6.0 HD engines may need a new flexplate to mate to the 6l80 since they run the HD flexplate.

As mentioned before it is critical to match your engine and transmission. Since the 6l80 has the TCM built in if you choose an incompatible engine and transmission you will not be able to program the TCM properly and will need to replace it or the transmission.

Part 7 Transfer case

Transfer case adapter is dependent on the transfer case you choose. We highly recommend you run a 2007-11 JK 241J (2007-16 manual JK) transfer case for several reasons.

- All JK transfer cases run a TCRS (transfer case range sensor). This TCRS sends a signal to the TIPM to determine the transfer case position. This information is important since transfer case position determines ESP modes, transmission shifting and controls the indicators on the instrument cluster.
- The 241 J transfer case uses a 2.7:1 front planetary with a 23 spline front input gear. While weak once you install our HD 32 spline input gear the 241 J is good for 450+ HP.

- The 241J 2.7 low ratio when mated to the 4:1 6l80 first gear results in virtually the same low ratio as a stock Rubicon with a 4:1 low range and 2:8 first gear. This is an ideal low ratio for general off-roading. A lower ratio than this will lead to low wheel speed making it difficult to run in sand, mud and snow.
- The 241J is readily available and if you have a Rubicon we can help you trade your 241 OR (off-road) transfer case for a 241J plus some cash.
- We do not recommend the 241 OR transfer case from a Rubicon in the swap. The 241 OR front planetary is weak with the 23 spline input and the ratio is too low for general off-roading. If you insist there is a stub shaft available for the 241 OP but it is not

Motech offers two transfer case adapters. The first is a full size adapter that runs a HD GM 4x4 transmission mount. This adapter is very strong and bolts the transmission mount directly to the adapter with two 7/16” studs which mount directly to the transmission plates. It is highly recommended you run this adapter due to the strength. This adapter mimics the GM transfer case adapter but clocks the transfer case to the proper positon. In addition this HD adapter is longer so it is compatible with a 2WD 6l80’s when you must cut off the output shaft. On some 2WD 6l80’s there is not enough spline to run the compact adapter below.

The second adapter is shorter than the HD adapter and helps maintain driveshaft length in a 2 door JK. This adapter uses the MoTech “L” bracket to adapt the horizontal studs to a full size GM transmission mount. The full size GM 4x4 mount is stronger than the single stud 2WD mount and aftermarket poly mounts. We do not recommend this adapter for high HP applications.

Hardware:

Part 8 MoTech LS JK Basic Builder Kit Contents

Part #	Qty	Description	
MTACF	1	Air compressor front bracket - billet	
MTACM	1	Air main bracket - billet	
MTACR	1	Air compressor rear bracket - billet	
MTAFT or MTAFP	1 1	Air filter mount truck engine Air filter mount passenger car engine	
MTAITT MTAITP	1 1	Air intake tube aluminum powdercoat – truck Air intake tube aluminum powdercoat – passenger car	
MTSB	1	Air intake silicone bending reducer 4” x 3.5”	
MTTC40	1	Air intake 4” T-bolt clamp	
MTTC35	1	Air intake 3.5” T-bolt clamp	
MTALTT MTALTP	1 1	Alternator bracket – truck - billet Alternator bracket – passenger car - billet	
MTALTB	1	Alternator bushing 1” x	
MTALTH	3	Alternator mounting bolts 10mm x	
MTALTIP	1	Alternator idler pulley	
MTALTIPB	1	Alternator idler pulley bushing	
MTALTIPBO	1	Alternator idler pulley bolt	
MTALTIPW	1	Alternator idler pulley washer	
MTALTTBBU	1	Alternator top bracket bushing .5”x1”	
MTALTTBBO	1	Alternator top bracket bushing bolt 6mm x 35mm	
MTALTTBW	1	Alternator top bracket washer 6mm	
MTCB	1	Coolant bottle stainless steel 3” x 10”	
MTCBM	1	Coolant bottle mounting bracket powdercoat	
MTCBB	2	Coolant bottle mounting bolts	

MTCBW	2	Coolant bottle mounting washers ¼" x 1"	
MTCBN	2	Coolant bottle mounting nylon lock nuts 1/4" x 20	
MTFS	3	Fan spacers ½" x ½"	
MTFSB	3	Fan spacer bolts	
MTEFMD	1	Frame mount driver	
MTEFMP	1	Frame mount passenger	
MTEFMB	4	Frame mount bolt 10mm x	
MTEFMBC	2	Frame mount bolt 10mm x	
MTEFMW	10	Frame mount washer 10mm	
MTFLT MTFLP	1 1	Fuel line – truck Fuel line – passenger car	
MTPSPF	1	Power steering pump bracket - billet	
MTPSBB1	1	Power steering pump bracket bolt 10mm x	
MTPSBB2	1	Power steering pump bracket bolt 10mm x	
MTPSBB3	3	Power steering pump bracket bolt 8mm x	
MTSB	1	Serpentine belt 6K1065	
MYSCB	1	Shifter cable main bracket	
MTTCLB	1	Transfer case cable mount "L" bracket	
MTTCLBB	2	Transfer case cable mount "L" bracket bolts	
MTTCLBW	4	Transfer case cable mount "L" bracket washers	
MTTCLBN	2	Transfer case cable mount "L" bracket nuts	
MTSL6 or MTSL4	1 1	Shift lever 6l80 6 position shifter Shift lever 6l80 4 position shifter	
MTTMU	1	Transmission mount upper	
MTTML	1	Transmission mount lower (2007-2011) only	
MTTMB1	2	Transmission mount bolts 10mm x 1.5 x flanged	
MTTMB2	2	Transmission mount bolts 10mm x 1.5 x flanged	
MTTMN	4	Transmission mount nuts 10mm x 1.5 flanged	

Electronics:

Part #	Qty	Description	
MTAPP	1	Accelerator pedal	
MTAPPM	1	Accelerator pedal mount	
MTAPPB	2	Accelerator pedal mount bolts 8 x	
MTAPP	2	Accelerator pedal nuts 8 x	
MTECM	1	ECM E38	
MTECMM1 MTECMM2 MTECMM3	1 1 1	ECM mount top without Spod ECM mount top with Spod ECM mount lower	
MTEVAPS	1	EVAP vent solenoid	
MTEFMD	1	Engine frame mount driver	
MTEFMP	1	Engine frame mount passenger	
MTEVAPH1	2	EVAP vent solenoid hose 1	
MTEVAPH2	1	EVAP vent solenoid hose 2	
MTEVAPT	1	EVAP vent solenoid “T” ¼”	
MTFTP	1	Fuel tank pressure sensor	
MTMWH	1	LS JK main wiring harness	
MTIH	1	LS JK interior harness	
MTIM	1	MoTech LS JK interface module	
MTIMH1	1	MoTech LS JK interface module harness	
MTIMH2	1	MoTech LS JK interface module harness	
MTMH	1	MoTech Module hardware	

Options:

	Qty		
MTTCAR	1	Transfer case adapter Ring	
MTTCLB	1	Transmission cooler line bracket	
MTTCAIG	1	Transfer case adapter input gear	
MTTCAB	2	Transfer case adapter bushing 1 ½” x 1”	

MTTCAB	2	Transfer case adapter bolts 7/16” x	
MTTML	1	Transmission mount lower	
MTTMU	1	Transmission mount upper	
MTR42S	1	Radiator heavy duty MoTech aluminum LS JK 42 mm single pass	
MTR52S	1	Radiator heavy duty MoTech aluminum LS JK 52 mm single pass	
MTR52D	1	Radiator heavy duty MoTech aluminum LS JK 52 mm dual pass	
MTAISG	1	Aeroforce Interceptor scan gauge	
MTAEVPC	1	AEV Procal	

Part 9 MoTech Basic Builder Kit Photo Identification

AC compressor front bracket  MTACF	AC compressor main bracket  MTACM	AC compressor rear bracket MTACR	Air Filter mount truck engine  MTAFT
Air filter mount passenger car engine  MTAFP	Air intake tube aluminum powdercoat – truck  MTAITT	Air intake tube aluminum powdercoat – passenger  MTAITP	Air intake silicone bending reducer  MTSB
Air intake 4” T-bolt clamp 	Air intake 3.5” T-bolt clamp 	Alternator bracket – truck billet 	Alternator bracket – passenger billet

Alternator bushing 1” x ½” 	Alternator mounting bolts 10mm x 30mm	Alternator mounting bolts 10mm x 130mm	Alternator Idler pulley Gates #

Part 10 MoTech Basic Kit Installation Overview and Shop Tools Required

Overview: Please note this installation kit is intended to be installed by competent mechanics with engine conversion experience. It is suggested you have the proper tools and manuals available to properly complete the conversion, a list of recommended tools and equipment follows.
Proper emissions equipment is included with each kit; however, this equipment along with the appropriate calibrations must be used to remain USEPA compliant. We recommend you check the local emissions regulations in your jurisdiction for compliance. You may contact us with emissions related questions at 725-502-8507.
The MoTech LS JK conversion kit uses OE GM hardware and software to function as intended and remain compliant. For this reason our modules are delivered with stock calibrations which support full emission monitoring, Mode 6 data and manufacturer supported trouble codes. Custom builds using GM performance engines, headers, cam swaps, etc. can be supported; please call 725-502-8507 for more information. We recommend you follow these instructions carefully and do not deviate on the install. As the originator of the functional LS JK swap years of experience has proven what works best and we suggest you start there.

Recommended shop tools:

- 2 Post lift – to remove the body.
- Basic hand tools.
- Electric or pneumatic impact can speed up the process.
- MIG welder (110V is fine) to install the engine frame mounts
- 4” hand grinder with cut-off wheels and grinding stones
- A/C evacuation/recharge machine. You may take your JK to a shop for EVAC and charge. Note 2015+ JK’s use R1234 refrigerant which requires different equipment than R134 JK’s.
- Protective equipment – eye, hand and ear protection.
- Basic scan tool or scanner to diagnose and set ECM parameters like crankshaft variation learn.
- Access to GM TIS/SPS programming to program your transmission.
- Soldering iron.
- Large C-clamps.
- Scrap 2x4’s

Miscellaneous shop supplies to have on hand:

- Chassis paint – semi gloss preferred.
- 6”-14” plastic tie wraps.
- Electrical tape, cloth or vinyl.
- Shop rags.
- Bungee cords.
- Solder and heat shrink tube.

Note: The appendix at the rear of this manual contains specifications, part numbers and technical data please read this manual in its entirety, including the appendix, before starting your swap.

Part 11: Prepping the vehicle

If you are running a Supercharger, Turbocharger, tuner or any other modification to your JK operating system remove it now. This includes tuners for tire size and gear ratio such as the AEV Procal and Superchips Flashcal. Please unlock it from you VIN before the swap and it can be relinked after the swap. If you are running a supercharger/turbocharger you may want to sell the programmer with the unit and purchase a low cost tire size calibration tool. If you are doing a Hemi to LS swap please give us a call and we will help you with the additional items required.

The MoTech conversion is noninvasive. The only chassis-body modification is the removal and installation of the engine frame mounts. There should be no need to cut or drill any holes in the vehicle. The MoTech kit is compatible with most aftermarket suspension systems, Spod's, air compressors, trailer tow packages, etc. Please call us before you purchase a kit if you have aftermarket accessories and we can set the kit up for you. We have different bracketry to support Spod's, different fan assembly's, accessory drives, etc.

If running V6 skid plates they should work except for the front section under the engine oil pan; if your skid plates reach up to the stock JK engine motor mounts give us a call.

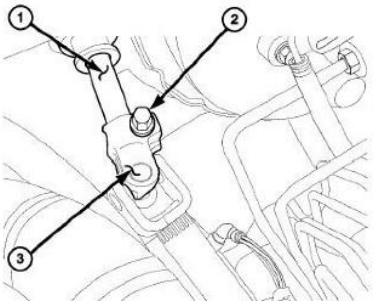
We recommend the vehicle be washed before starting the conversion. A clean vehicle helps identify problems and rust plus makes the conversion go easier. Once the body is separated from the chassis a pressure washer is recommended to clean off the mud and debris from the chassis.

Drain the oil and fluids from the engine, transmission and cooling system. Please leave the brake and power steering system alone. If running a GM accessory drive please drain the PS system.

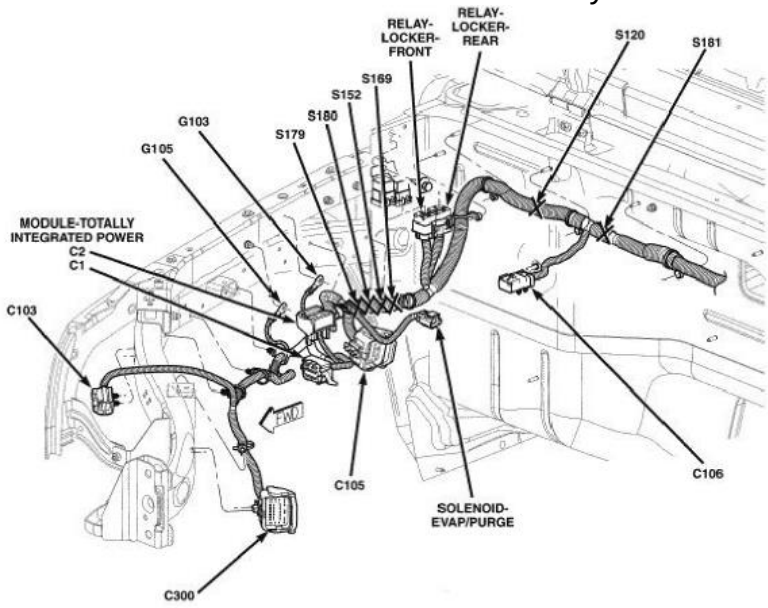
If you are a shop we recommend test driving the vehicle to identify problems. Check AC performance, cruise control operation, braking, bump and torque steer. If the vehicle drives poorly now it will be worse when you add more power. Document any drivability issues, vibrations or unusual noises and inform the customer. Many of these issues can be addressed during the conversion.

Part 12: Removing the body

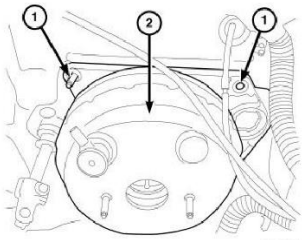
1. Disconnect the battery, always disconnect the negative terminal first and connect it last or you may damage the electronics.
2. Disconnect the battery cables from the firewall, TIPM stud (13mm hex) and ground stud behind TIPM (10mm hex). You want to remove the battery cables with the engine so set them on top of the intake.
3. Discharge the AC system with the appropriate equipment
4. Disconnect steering shaft at firewall. NOTE! Once the steering shaft is disconnected the steering wheel can freely rotate and snap the clockspring. Put the steering wheel in the straight ahead position and secure it with a bungee cord our other method to assure it does not rotate. If the steering wheel does rotate during the swap and you are not sure where it goes hook up a scanner and go to steering angle sensor data; set the wheel to 0 degrees when the steering wheel is straight up and the wheels straight. Notice the steering column can only connect to the steering shaft in one clock position, there is a moon shaped cut out and dome on one side of the shaft that will not allow it to go in the wrong way, do not force it.



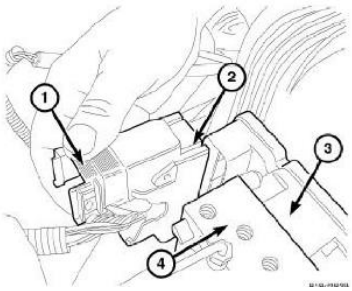
5. Disconnect the C300 connector near the bottom passenger side of the radiator, again this is a lever lock connector that is the main electrical connection between the body and chassis.



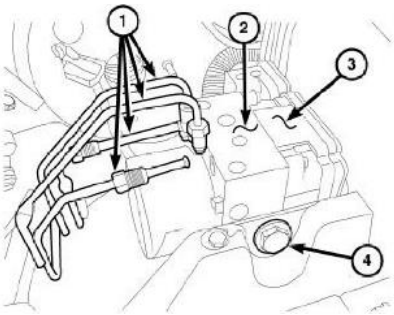
6. Remove the brake master cylinder from the booster and pull forward off the studs. Be careful there is an O-Ring sealing the master to the booster if you damage or lose this O-Ring you will have a vacuum leak and lean condition.



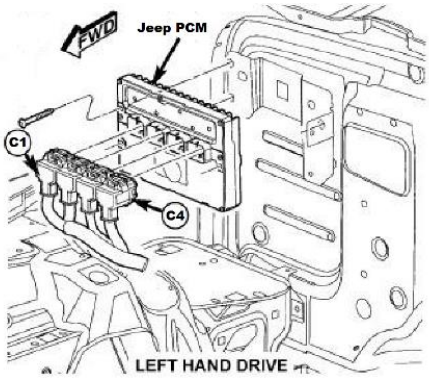
7. Also remove the single shouldered 1mm hex bolt holding the ABS module down to the fenderwell, this bolt is in the front of the module. Carefully lift the ABS module connector cover to release the connector from the ABS module.



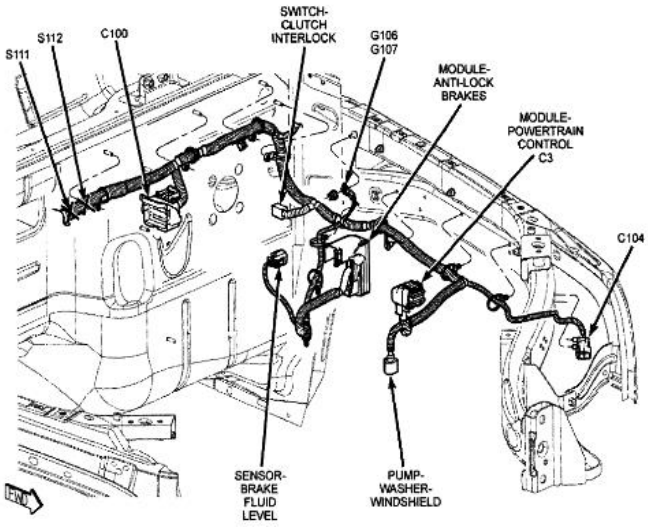
8. Gently pull up and pry the ABS module upwards until the two lower pins release from the rubber grommets in the fenderwell. Secure the ABS module to the engine to keep it clear of the body as it is lifted. Do not remove brake lines ① and ②, ③ is your HCU(hydraulic control unit) and ABS module. ④ is the shouldered bolt that holds the ABS module down. Remove this bolt and replace it so you don't lose it.



9. On automatic JK's remove the Jeep PCM connectors 1, 2 and 4. Connector 1 is closest to the fender and connector 4 is closest to the engine.

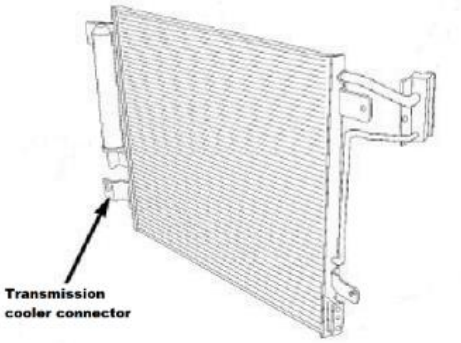


10. Do not remove connector 3 it will stay with the body. Note: on manual transmission JK's you will not have connector 4. Carefully remove the C100 harness starting at the Jeep PCM, remove the snaps on the fenderwell and the firewall. Place the C100 harness on top of the engine during the body lift. DO NOT remove the harness in the picture below, notice the PCM connector shown is C3 and stays on the body.



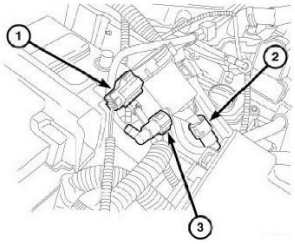
11. Disconnect the O2 sensor under the master cylinder.
12. Remove the upper and lower radiator hoses and heater hoses from the engine.

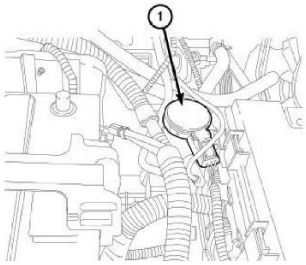
13. Disconnect the transmission cooler lines at the lower driver side of the radiator/condenser. The transmission cooler is inside the condenser and the quick disconnect fittings can be difficult to remove. We suggest you cut the lines and discard the automatic AC condenser. Run a manual JK condenser with a proper transmission cooler in front of the radiator, this will allow better airflow to the radiator and proper transmission cooling.



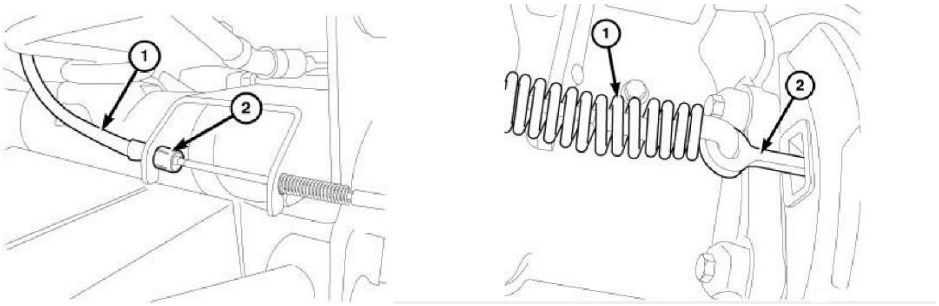
14. Remove the PS reservoir from the core support and secure to the engine for the body lift.

15. Remove the purge line going from the engine to the purge valve mounted on the fenderwell in front of the battery.

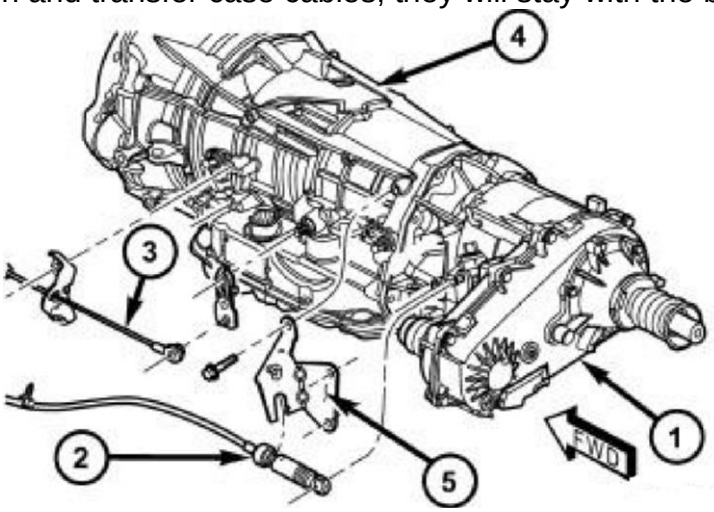




16. Remove the brake booster hose from the engine, you will use this on the LS engine so do not damage it.
17. Remove the air cleaner assembly.
18. There is a ground strap that runs from the hood to the firewall to the engine on the passenger side. Remove this strap at the engine and tie it up to the hood. Protect the hood with a soft blanket and flip it back onto the windshield.
19. Disconnect the E-Brake cables at the rear disc dust shields, tie the E-Brake cables to the body during the lift.

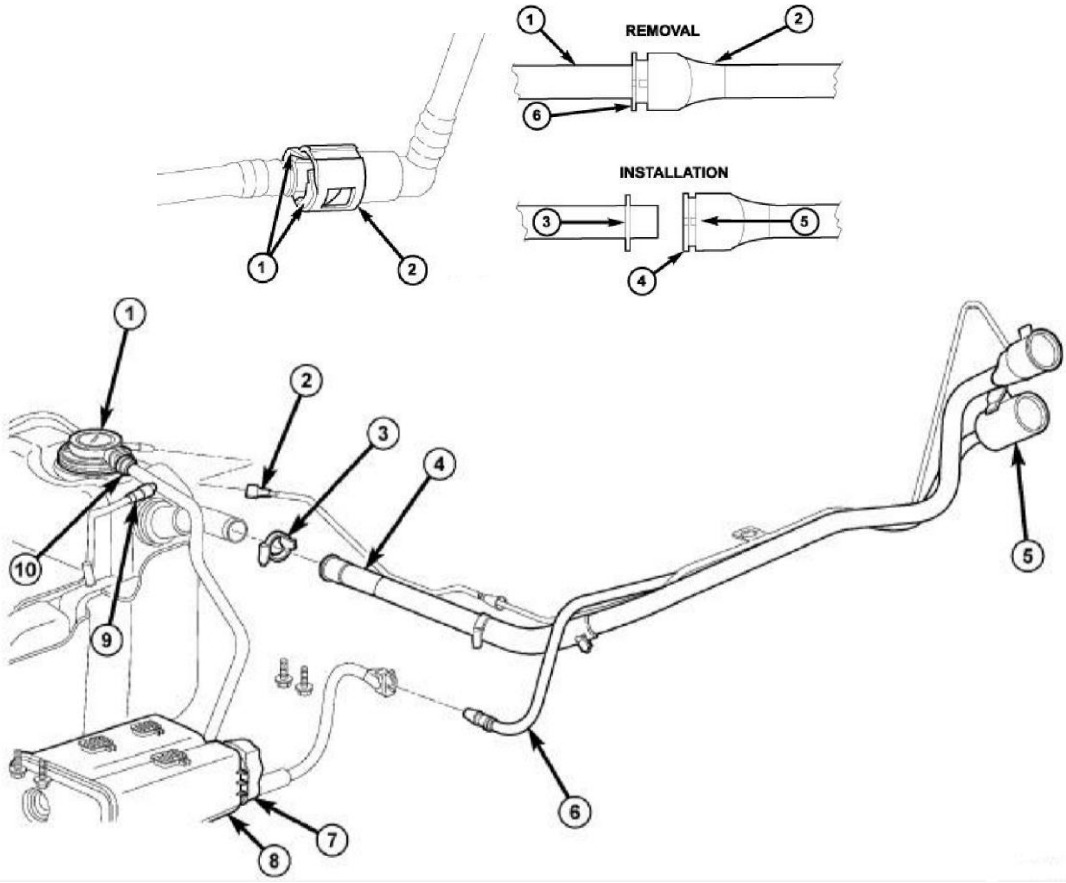


20. Disconnect the transmission and transfer case cables, they will stay with the body.

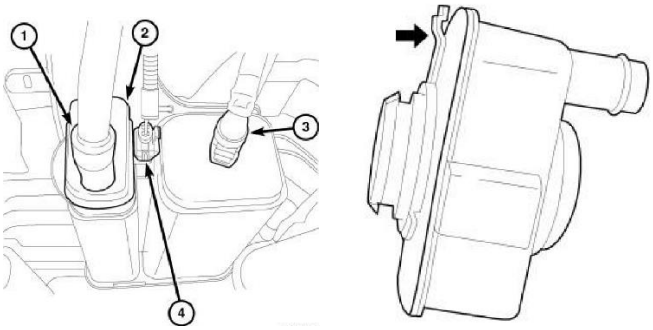


21. Disconnect the fuel filler hose where is connects to the intermediate tube. This would be a good time to upgrade the intermediate pipe if you do not have the anti-spit back tube. The new design incorporates a one way flap to keep fuel from traveling back up the fill tube and spilling out. Here is a picture of the new intermediate pipe part # CNNNX321AC.

22. Disconnect the EVAP vent hose between the EVAP canister and body. Here are some common connectors used in the JK and how to separate them.

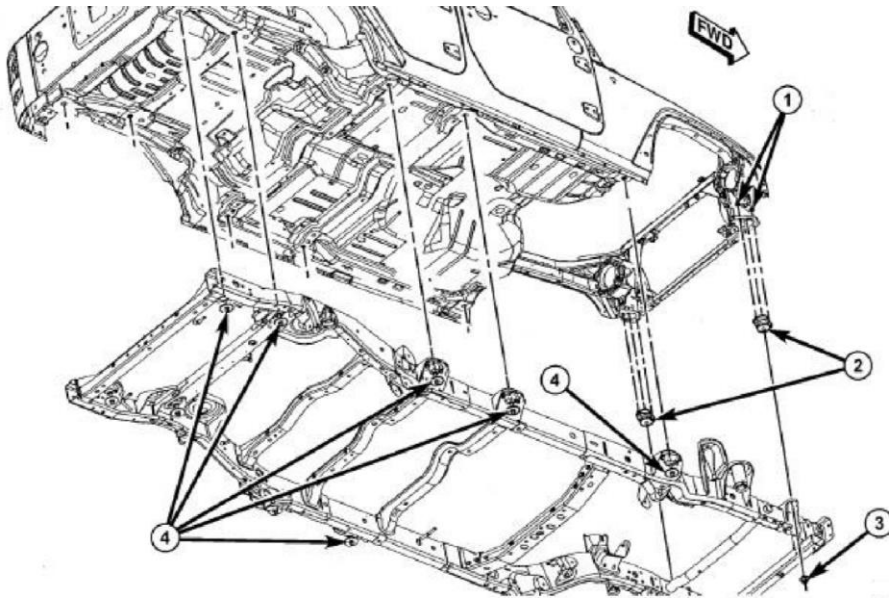


In the following illustrations is the EVAP canister and the ESIM. ESIM stands for EVAP System Integrity Monitor. The ESIM is a primitive way of controlling EVAP system pressure. Basically there is a spring loaded valve inside the ESIM that controls fuel system pressure by venting for excessive pressure and vacumn. There is a switch on the ESIM the PCM uses for EVAP monitor testing. Your LS will use a more sofsticated EVAP system which is closed loop feedback. This means we will install a fuel tank pressure sensor(FTP) and a ECM controlled vent solinoid. Your ESIM will be used but modified in a later step, basically we will pin the internal ESIM valve so the GM FTP sensor, purge valve and vent solinoind can do their job more effiecinently.

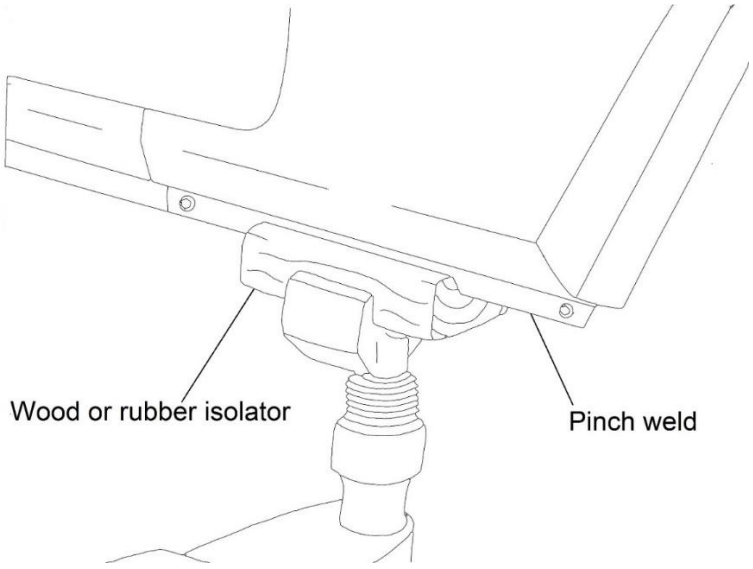


23. Disconnect the axle vent lines if attached to the body.

24. Remove the body bolts and (2) nuts. Earlier JK's run the 4 rear section body bolts but around 2010 Jeep stopped using the two front bolts. There are three body bolts on either side of the center frame and two nuts with studs on the lower core support. Mark the position of the body bolts since they are different sizes. When you remove the nuts off the core support note the position of the studs in the hole they should be near the center. If you have a hard time with the rear bolts go easy as the weld it may break loose in the body; if it does you will need to open up the body and repair it.



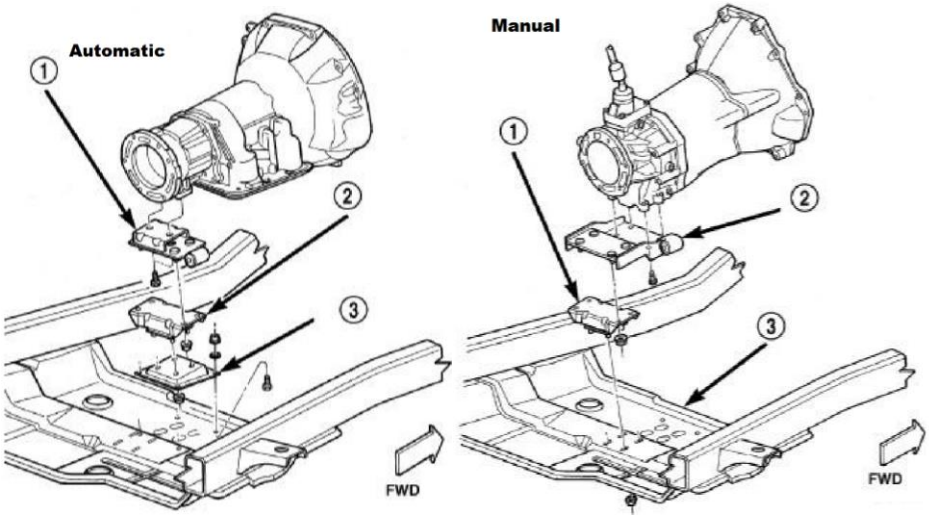
If using a two post lift grab the body pinch weld near the front and rear. Use a 2x4 or and rubber insulator between the body pinch weld and the lift arms. You may cut a couple slots in the 2x4 to fit around the pinch weld to help keep them in place.



If you have rock rails and cannot position the lift arms you may try a heavy tube in your two post arm without the pad to reach up and around the rails. Have the tube center over the bolts near the front and rear of the body to center them. Remove the pads from the lift arms and make sure the tubes are secure in the arms and protect the body where the tubes makes contact.
Have a spotter or two at hand. Slowly lift the body and observe interferences. If you have rock lights, ARB air lines, trailer hitch look for anything that could get damaged. Pay special attention to the ABS Module and lines they can snag on the fenderwell and get damaged. Also make sure the transmission, transfer case cable and E-Brake cables are clear.
Lift the body about 1 foot at a time and then walk around your JK looking for interferences. When you are sure there are no issues lift the body off the chassis. Watch the top of the lift, make sure the hood, light bar or roof does not contact the lift or lift shut off bar.

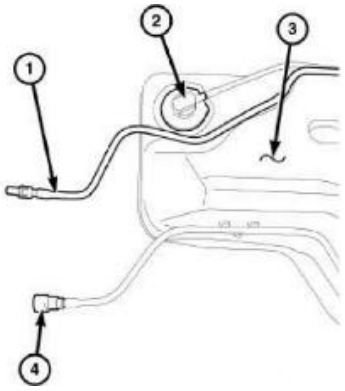
Part 13: Prepping the chassis

1. Remove the exhaust system. The bolts on the exhaust manifolds have a tendency to seize and in general it is difficult to disassemble the exhaust. You can cut the exhaust off using a Sazwall. If the slip joint near the crossmember does not come apart just cut it off. With a 5.3 engine you can use the rear exhaust section but it will limit performance and sound quiet. Otherwise remove the exhaust system and discard.
2. We recommend you remove the transfer case from the transmission. Make sure to unplug the transfer case range sensor on top of the transfer case since it will be used again.
3. Remove the engine and transmission mounting bolts.



4. Unplug the alternator, AC compressor and AC Pressure switch. The AC pressure switch is the round 3 wire connector on the line between AC condenser and AC compressor.
5. Remove the P/S pump from the engine and tie to the core support, the P/S system does not need to be opened or drained. If you are running a GM accessory drive remove the P/S pump, lines and reservoir.
6. Remove the old transmission cooler lines and seal off the transmission.
7. Remove the exhaust shields near the starter motor then remove the starter motor to gain access to the battery cables. Remove the battery cables from the engine and set aside, they will be used again.

8. Remove the driveshafts.
9. Disconnect fuel and purge line at front of fuel tank. Note: the larger 3/8" line is the fuel supply line and can be under 60 psi pressure, relieve pressure at the Schrader valve if there is any question. The smaller 5/16" line is the EVAP purge line and will have no pressure. Refer to the previous illustration for disconnecting the lines.



① Fuel line to LS fuel rail.
②Purge line to GM purge valve on fuel rail or head.

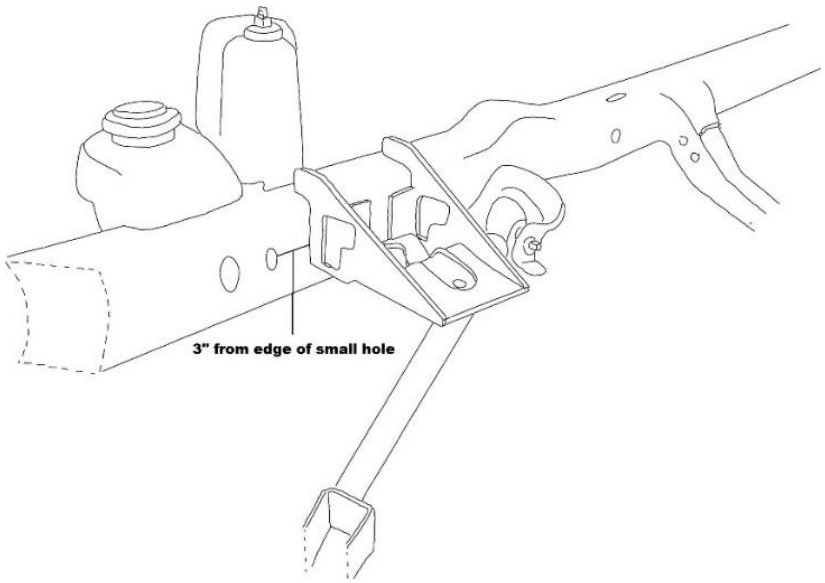
10. The MoTech kit includes an EVAP canister relocation bracket. We suggest you remove the EVAP canister at this point and relocate it to the rear crossmember in front of the rear axle. Leave the canister in the factory bracket since it will be used in conjunction with the MoTech bracket. We prefer to relocate the EVAP canister for a couple reasons. One it puts the canister in a better protected position; and two, it allows us to put a muffler where the canister was.

11. Now it's time to pressure wash the chassis. If you don't have a gas pressure washer purchase an inexpensive electric washer at Harbor Freight or Home Depot. Protect any vents, open connectors and lines with a plastic bag and rubber bands. Thoroughly wash the frame, axles and other components. Jeep does not protect some metal parts as good as they should and you may see rust, especially around where the frame welds are. Concentrate around the engine frame mounts since we are going to do welding in that area.
12. When satisfied with the wash let the chassis dry out. Now is a good time to inspect your frame and other components. If you see any surface rust use some POR to repair it. Get a few cans of high quality semi-gloss chassis paint and hit all the area that have primer or bare metal showing. If you are from back east and see serious rust repair it now. When complete the chassis and components should be clean and properly painted.

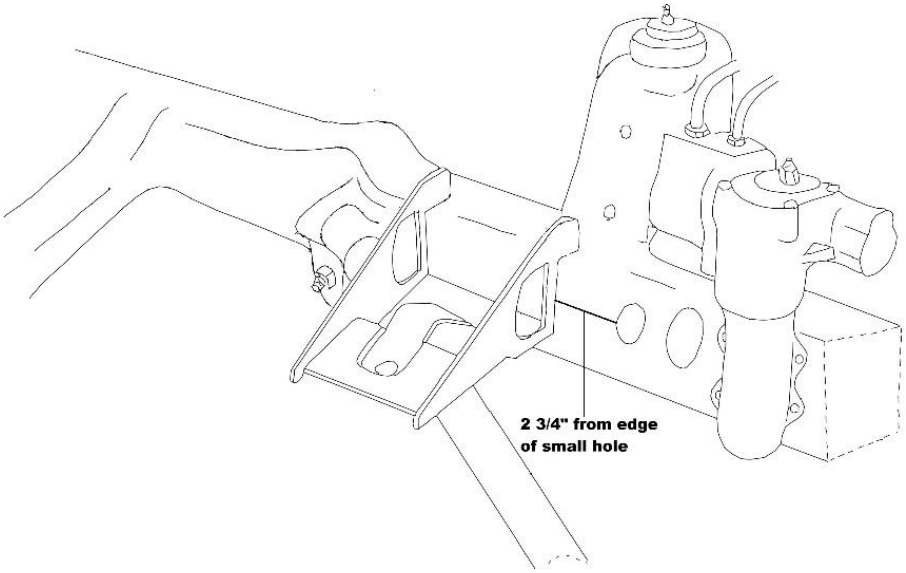
13. Remove the V6 engine frame mounts. We use a 4" grinder equipped with a cutoff wheel. Be very careful use protection for your hands, arms and face.

14. Important: remove the brake lines near the engine mounts. Pop them out of the clips holding them and move them aside so they are not damaged by the grinder. Also remove the ABS sensor wires out of the way.
15. Score the weld between the engine frame mount and the frame DO NOT cut too deep; you do not want to cut into the frame base metal. Once the weld is sufficiently weakened use a heavy hammer to knock off the mount.
16. Once the mounts are removed switch to a grinding wheel on your grinder. Run the grinding wheel along the remaining weld. Smooth down the frame then install a floppy disc sanding wheel on your grinder. Remove the paint off the frame around where you are going to weld the frame mounts on.

17. Hang the frame mounts on the frame, notice the driver side has a “D” cut into the side plate; the passenger side has a “P” cut into its side plate. The passenger side frame mount is placed 3” behind the small hole in the frame.



18. The driver side mount is place 2 ¾” behind the small hole in the frame.



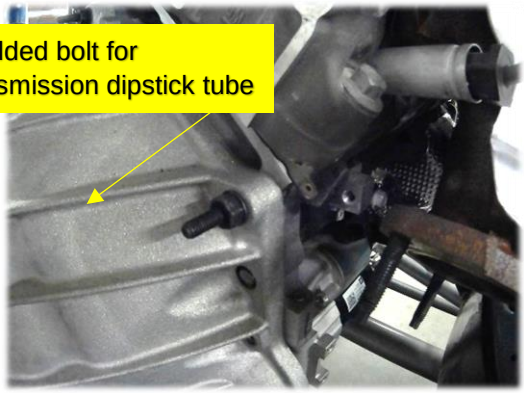
19. Using a MIG welder tack the mount in place. Be sure both top ears are sitting on the top of the frame and the mount is pushed up against the frame. Double check your measurements then weld the mounts in place. Try and use the “stitch weld” method where you run one bead then run the next bead across the mount to spread out the heat. Before the frame cools completely shoot the frame with some quality paint.
20. Reinstall the ABS wires and brake lines.

21. Install the upper and lower transmission crossmember plates per this illustration. Leave the transmission plates slightly loose so they can be aligned properly after the engine/transmission is dropped. Notice the crossmember is slotted front to rear and the transmission plates are slotted left to right.

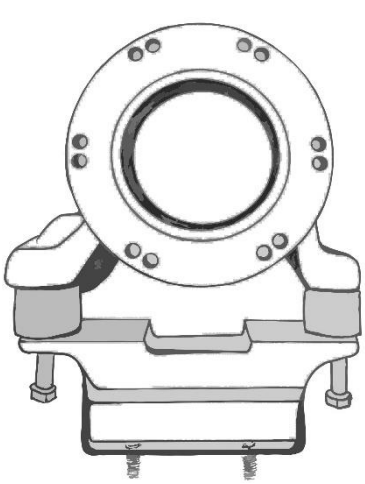
Part 14: Installing the Powertrain

1. Verify your engine and transmission are compatible, refer to the Appendix in this manual. The Gen IV GM engines run an ECM (engine control module) and must be properly matched to the TCM (transmission control module).
2. Replace the studded 6mm bolt on the rear passenger coil pack with a standard 6mm bolt to avoid contact with the firewall.

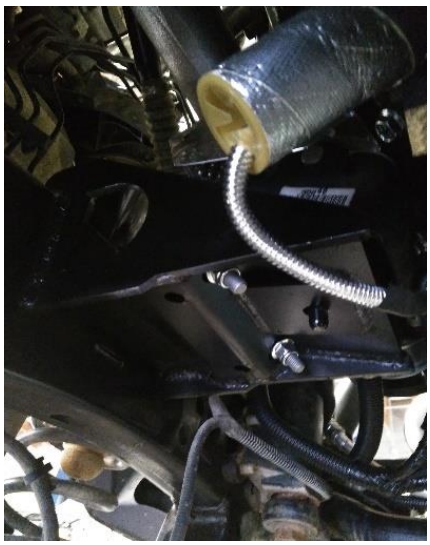
3. Bolt the engine and transmission together, make sure the torque converter is seated properly. If running a 6.0 HD engine you may have to swap out the flexplate for a ½ ton GM truck flexplate GM part # 1256313[illegible] Use 10mmx 1.5 bolts to hold the transmission the engine and u[illegible] one stud headed bolt where the transmission tube mounts. If you do not run this stud headed bolt and install the transmission tube directly to the bellhousing it may pull the tube out of the transmission. Be sure and torque the crankshaft to flexplate bolts to 74 foot pounds over 3 passes. Torque converter to flexplate bolts can be accessed through the starter hole and are torqued to 47 foot pounds. Please refer to the torque specifications in the appendix of this manual.

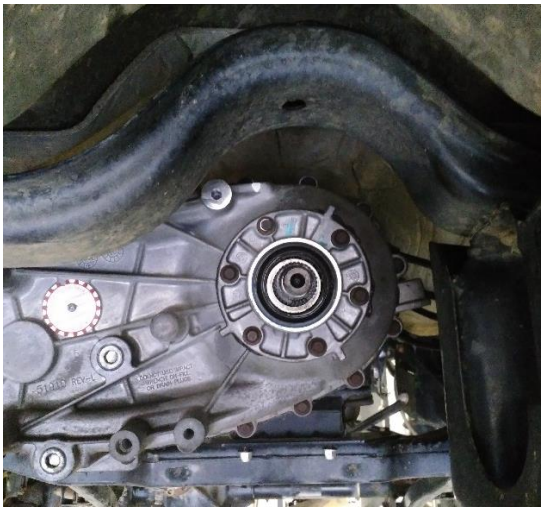


4. Install the engine mounts. MoTech runs stock GM hydraulic mounts part # ACDELCO 15878845.
5. Install the MoTech transfer case adapter to the 6l80 transmission. The transfer case adapter is dry so no seals are required. MoTech designed a heavy duty transfer case adapter to handle high output engines. The MoTech transfer case adapter uses the stock GM truck 4WD dual stud transmission mount Anchor part # 2638. Using the two 7/16” bolts and 1”x1 ½” spacers supplied with you adapter bolt the transmission mount to the adapter. Notice the aluminum spacers go between the transmission mount and the adapter.
6. Notice the 1 ½” spacers between the transfer case adapter and the transmission mount.



7. We are now ready to drop the engine and transmission in the frame. Make sure your frame mounts are painted, rear crossmember is installed and there are no obstructions. We prefer a spreader bar to grab lift brackets on the LS engine. Lift brackets come installed on many crate engines and even on some production engines. Attach the engine/transmission to your hoist with about a 3 degree drop to the rear. You can come in from the front or side based on your engine hoist, if you have a front bumper/winch it may limit reach. Lift the engine over the frame and get it positioned over the mounts. Slowly lower the engine into the frame observing the **pins on the motor mounts** and studs on the transmission mount drop into the appropriate holes. The picture below shows a Pentstar JK crossmember and there is no need for the lower plate. If you prefer once your transmission is lined up properly you may weld in you transmission plates, please request transmission plates that are not powdercoated. Get the transfer case output centered in the crossmember hoop if you are running a stock axle; if you are running an aftermarket axle with a different pumpkin offset align the transfer case output as required. Loosely install the engine mount and transmission mount hardware.



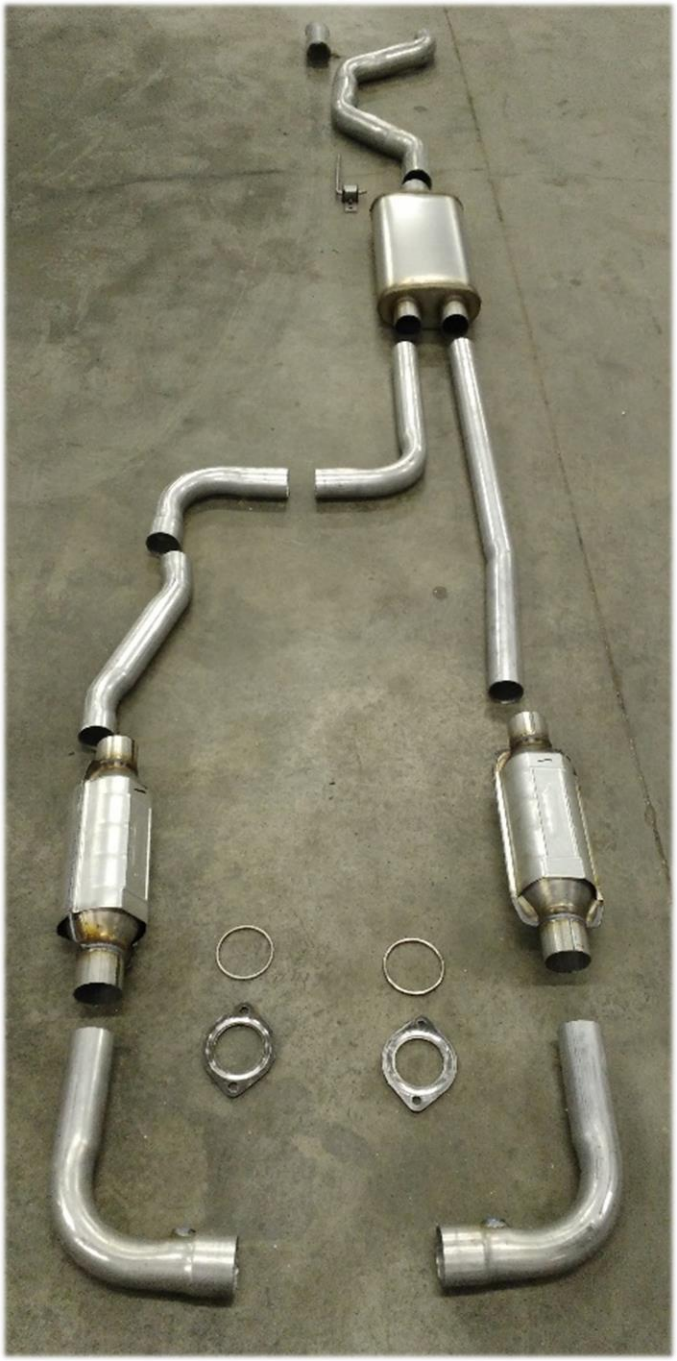


8. Once the engine and transmission mounts are resting on the frame look at the positioning. Do not release all the weight off the hoist yet. With most of the weight of the engine still on the hoist look at the three holes on each engine mount, make sure they line up. If they are off jockey the engine around until they line up then release the weight off the hoist. Install the (6) engine mount bolts provided into the engine mounts, leave them slightly loose.
9. Go to the rear of the chassis and sight up the frame; the output of the transmission should be in alignment with the hoop in the center crossmember. Note: if you have an aftermarket axle the pinion may be closer to center, the stock JK offsets the driveshaft to the passenger side. The goal is to have the transmission output aim directly at the pinion at ride height. As the rear axle travels up and down it will move left and right so we want the driveshaft to be in a neutral position at ride height. You may use a straight edge to help locate center, run it forward off the hoop in the crossmember and to the transmission output. In the picture below is a custom chassis with the frame and differential set to the center.

Notice if we place the transfer case output in the stock position (lined up with the original crossmember hoop) the driveshaft will run at a side angle. In normal operation the axle moves left and right anyway but we want to minimize and angular errors as much as possible. If running stock axles line the transfer case output up with the stock crossmember hoop. Once in the proper position tighten the transmission and engine mount bolts. Some customers prefer to weld the transmission plates to the crossmember rather than bolt it; if you wish to weld yours please request the transmission plates not be powdercoated.

10. Remove the hoist and check all clearances. The LS is a compact engine and you should have no interferences. Install your exhaust manifolds if they are not already installed. If you are running LS3 manifolds you may notice the passenger side manifold gets close to the upper control arm bracket. No worries we will trim a small piece off the UCA bracket and the exhaust will fit perfectly. If using MoTech's DIY exhaust kit please specify of you are running LS3 or Trailblazer manifolds so we can supply the correct exhaust system. Part numbers for the exhaust components are listed in the appendix.

11. If running the MoTech DIY exhaust system you may install it now; however, we prefer to wait until the body is on. Once the body is on it will be easier to see the converter to body clearances. The MoTech DIY exhaust kit is assembled from several sections so you can fine tune the routing before you weld or clamp the system together. Do not let the converters get too close to the floorboards or the O2 wires. Properly route all wires, fuel lines, vent tubes, etc. away from the exhaust.



Note: We do not recommend headers unless you have a special need. Stock GM manifolds are good to 450+ HP, run cool and quiet. We have run headers on many builds and find they add heat, noise and potential exhaust leaks to the build.

Part 15: Accessory Drive

Important: You must specify when ordering your kit which drive you are going to use so we can set up the appropriate lines, hoses and electrical connections.

JK accessory drive:

There are many options when it comes to accessory drives for your LS JK and we have our recommendations. You can run your stock 2007-2011 JK accessories from your JK on your LS engine. Over the years we have discovered running the stock JK accessories have many advantages. MoTech billet accessory drive brackets place the JK alternator, PS pump and AC compressor approximately where they were in the original configuration.

- Smart charging through TIPM is maintained.
- Original PS lines can be used.
- Original PS reservoir can be used.
- Original alternator connections can be used.
- Original AC pressure and compressor connections can be used.
- Original AC hoses can be used.
- No interference with driver low AC mount to upper control arm.
- No interference with driver low AC mount to frame.
- No interference with driver low AC mount to engine frame mount (Corvette offset).
- Can run PSC or other aftermarket PS pumps designed for the JK.
- No interference with PS pulley to steering gearbox.
- Run stock PS fluid.

Early on MoTech used steel plate accessory drive brackets; due to tolerances from welding, powdercoating and other factors the brackets were slotted to assure a perfect fit. The steel plate brackets required the installer to properly align and shim the accessory drive so the belt ran true. When properly installed MoTech's steel accessory drive brackets will run reliably for the life of the engine; installed improperly and you will have belt squeak or pre-mature wear of the belt.
MoTech has introduced billet LS JK accessory drive brackets, these billet brackets are precision machined and require no alignment. MoTech's billet brackets not only function properly but look superior to the other drive options. Installing MoTech's billet accessory drive brackets is just a matter of bolting them on and installing the belts.

GM accessory drive:

Running the GM accessory drive has a few advantages and disadvantages:

- Accessory drive kits readily available from GM – see part's list.
- GM components cost less than JK components.
- GM truck PS pumps work well with hydraulics.
- Requires custom MoTech AC hoses.
- Requires custom MoTech PS lines.
- Requires AC compressor wiring be modified.
- Requires alternator wiring be modified.
- LS3 PS pumps do not do well with hydraulics.
- Run GM mineral based PS fluid (recommended).
- AC compressor interference with passenger upper control arm 3.5" lift recommend.
- AC compressor interference with frame (use Sanden AC compressor).
- AC compressor interference with engine frame mount with Corvette offset drive.
- Possible PS pump pulley interference with steering gear.

Truck engines LC9 accessory drive:

On truck engines (5.3, 6.0, and 6.2) use the GM LC9 accessory drive kit (part # 19258433) without air conditioning. Purchase the kit without AC since the stock Gen IV AC compressor will interfere with the passenger UCA and frame rail. If running the GM drive MoTech will supply an AC compressor mount for the compact Sanden 508 style compressor. The fit is still tight but works well when installed properly.

The alternator supplied in the GM LC9 kit is self-exciting and only requires a one wire hook up. If you indicate you are running the GM drive MoTech will set the harness up for this wire. If running a production Gen IV GM alternator it must be connected to the E38 ECM as it is a computer controlled alternator. We prefer to stay away from the production Gen IV alternator due to the additional issues related to ECM control.

If you purchase a crate engine such as the L96, LC9 or L94 it should have the belt tensioner and PS/alternator brackets attached. Production engines will also have these brackets so purchase them with your lift out engine. If you don't get the Tensioner, hardware and PS/alternator bracket you must purchase them separately, the part numbers are in the parts list in the appendix.

We do not recommend mixing component's between the truck and passenger car engines. Throttle bodies, water pumps and intakes are different and not compatible.

You can run the production or GM Performance Truck PS pump with your swap they work great and some are even designed for Hydroboost brakes. If running hydraulics you may need to increase the volume of the truck PS pump or the steering may chatter or high effort at low rpm's. Do not do this mod unless it is required since too much volume may lead to loose feeling steering. The following article is courtesy of WTO the manufacturer of Redneck Ram. We suggest you do not do this mod until after the vehicle is running and you experience low speed steering chatter or high effort steering. The LS truck engines can idle below 500 rpm so getting proper PS fluid flow becomes a balance of load (tire size, hydraulic cylinder size, steering geometry, etc.) and PS pump output for the proper feel.

The GM drive runs the AC compressor off the rear groove of the balancer, a small low tension tensioner is included in the kit. While the tensioner makes the belt easy to install they can be troublesome. If your AC belt chatters or gets loose (due to a bad tensioner) you may consider running the GM stretch belt for your application. The stretch belt is different than a normal belt so be sure to purchase the proper belt.
If running the GM truck water pump, and this applies for both the GM and MoTech drive, you need to watch your water pump to cooling fan clearance. MoTech includes a fan spacer kit to move the fan motor forward on the cooling fan shroud assembly to gain water pump clearance. Below are some recommendations when installing your fan assembly. If you need to install the cooling fan assembly after the body is on and you have a truck water pump do the following.
Remove the top four core support to body bolts. Loosen (or remove) the four lower core support to body bolts. This will allow you to pull the core support forward and slide the fan assembly in without fighting the outlets and shroud. Be sure to run the two side rubber flaps (remove for intercooler?) and lower valance that came with your JK if possible (removed for bumper?), they aid airflow through the radiator.

- If running a stock JK radiator, or the MoTech 42mm aluminum radiator, the fan spacer kit supplied should give you enough clearance between the cooling fan motor and water pump.
- If running the MoTech 52mm single pass radiator with the truck water pump you will need to cut off the front threaded section on the water pump pulley to clear the cooling fan motor. This can be accomplished with a 4" grinder and cut-off wheel. The inner water pump shaft is hardened and very difficult to cut with a hack saw or Sazwall. Be sure to wear hand and eye protection (unlike the picture) and protect components from the debris.

- If running the MoTech 52 mm dual pass radiator you should have proper clearance between the cooling fan motor and water pump.
- If you upgrade to the PWM out runner Pentstar fan cooling fan motor to water pump clearance should not be an issue since the fan module is thinner than the DC brushed early JK fan motor.
- The LS3 based engines (Corvette offset included) should have no cooling fan to water pump interference. The passenger car engines do not run the threaded section to mount a thermal fan clutch so they have a lower profile.

LS3 (CTV) accessory drive:

The Gen IV Camaro 6.2 LS3's run the same offset as the Gen IV trucks. The Camaro accessory drive put's the alternator mid mount driver side, P/S pump top driver side and AC compressor lower passenger side. GM runs a shorter accessory drive offset in the Corvette than the truck or Gen IV Camaro. GM Performance came up with hybrid of the Corvette accessory drive offset with the Camaro configuration and called the CTV accessory drive (part # 19257325). The Corvette drive does not lend itself to the JK since the alternator is offset 17" towards the driver side and low, which puts it right into the Jeep PCM.

Install the CTV accessory drive per the GM instructions. You will use the MoTech passenger low AC mount kit with this drive which is included in the builder kit. The Sanden 508 style compressor is not included in the kit but can be added as an option. The Camaro PS pump works fine (use GM PS fluid not ATF4) if you don't have hydraulic steering. If you have hydraulic steering we recommend you replace the GM PS pump with your JK PS pump (and run ATF4). A couple extra brackets are required so call us for details we will supply them for you.

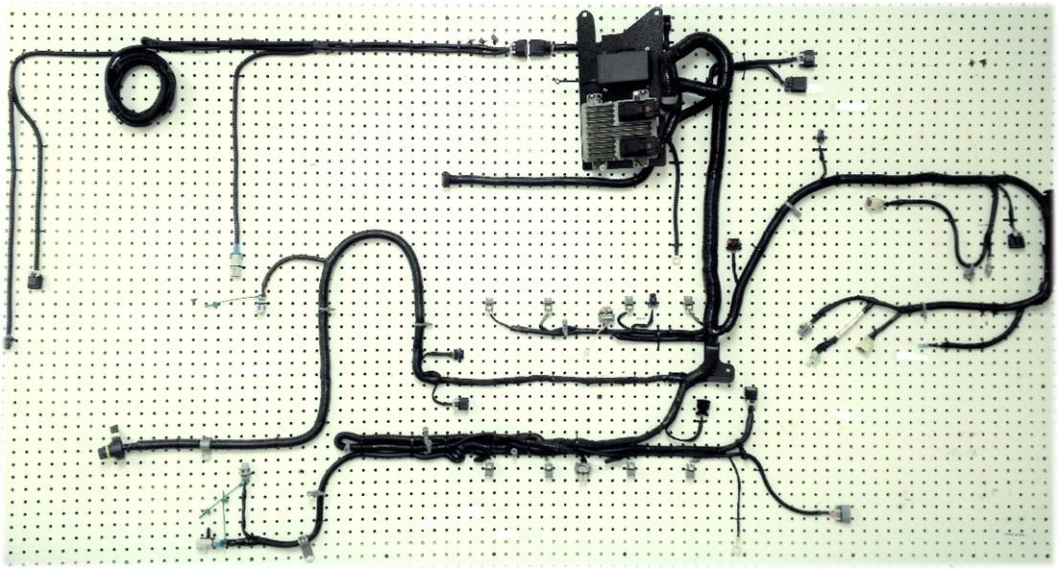
Part 16 Wiring the LS JK

Harness Overview:

Lay out your MoTech LS JK harness on a suitable surface to get familiar with it. MoTech's harness is built to OE level quality and functionality. MoTech does not remove critical power or ground distribution circuits to cut costs. This means you will maintain factory redundancies for limp modes and diagnostics. For instance if you short out an injector it will only affect one bank so you can drive home on the other bank of cylinders, same for coils. In addition modern operating systems run power distribution diagnostics to pinpoint issues and maintain proper circuit protection. If we were to gang several circuits to one fuse each load device would have to reach a higher circuit failure amperage which may lead to damage prior to the fuse blowing.
Modern computers supply ground to vital sensors for more accurate feedback, this ECU supplied ground is called low reference. Like power distribution ground distribution is critical to supply sufficient current to each circuit, GM depends heavily on ground circuit monitoring since a weak ground may lead to one of many reduced power modes and other issues.
MoTech uses a weatherproof Bussman power distribution box with proper circuit protection and high quality relays for fuel pump and powertrain control. This PDC is placed in the engine compartment where it is easily serviced and centrally located to best distribute power the vehicle.
MoTech incorporates an ECM, TCM and BCM in the network for functionality and diagnostic purposes. What this means is you are running a full OE level network with proper diagnostics to be safe, emission compliant and ensure functionality as the manufacturer intended it. This also means we have more wiring and modules to deal with during the install; however, not to worry since our harness is designed for easy installation and the critical work is already done for you.

The MoTech harness basically has two major components, the engine harness and the interior harness. We have conveniently added a 28 pin high quality firewall connector so the engine and interior harness can be disconnected to separate the body from the chassis. There is no cutting holes in the firewall to connect the two harnesses together.

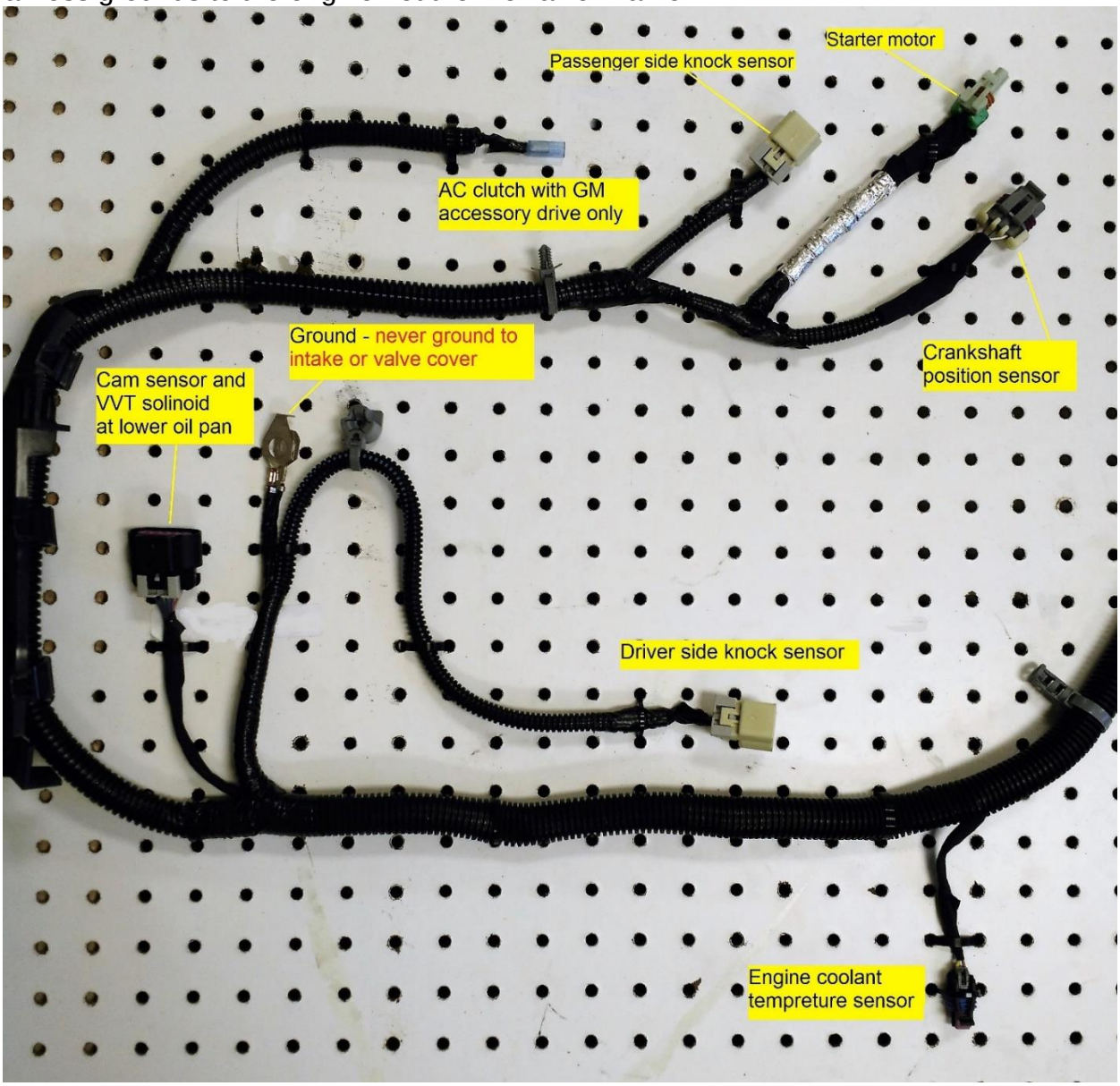
The wiring harness is the heart of the swap and must be installed properly. Use common sense and do not run wires near the exhaust or moving components. Do not run wires near the steam port crossover pipe at the front of the engine, this pipe get hot and will melt the harness. Do not allow the harness to come in contact with the radiator. On the passenger side lower core support is the C300 body to chassis connector; when running the HD radiator you may have to run this connector on the outside of the frame rail so it does not contact the radiator. You can also tie it up out of the way if you have the room.
Do not run wires down the firewall near the exhaust manifolds. Run the main LS harness down the back side of the intake and along the back of the transmission. The starter wire is incorporated into our harness and plugs directly into the starter. If you have a custom set up and must run the starter solenoid wire from the rear extend it and run it low on the bellhousing, then up by the motor mount and finally rearward to the starter.
Use proper fasteners to route your harness. It's a good idea to get a handful of rubber isolated Adel clamps to keep the wiring clean. Run one 1 ½" Adel clamp off the driver side valve cover where the harness jumps over to the ECM; this will keep it elevated above the coils.
Our harness includes many factory clips which should be used. Secure the harness to the front of the oil pan as designed to keep the harness away from the balancer.



Let's look at the harness in detail:

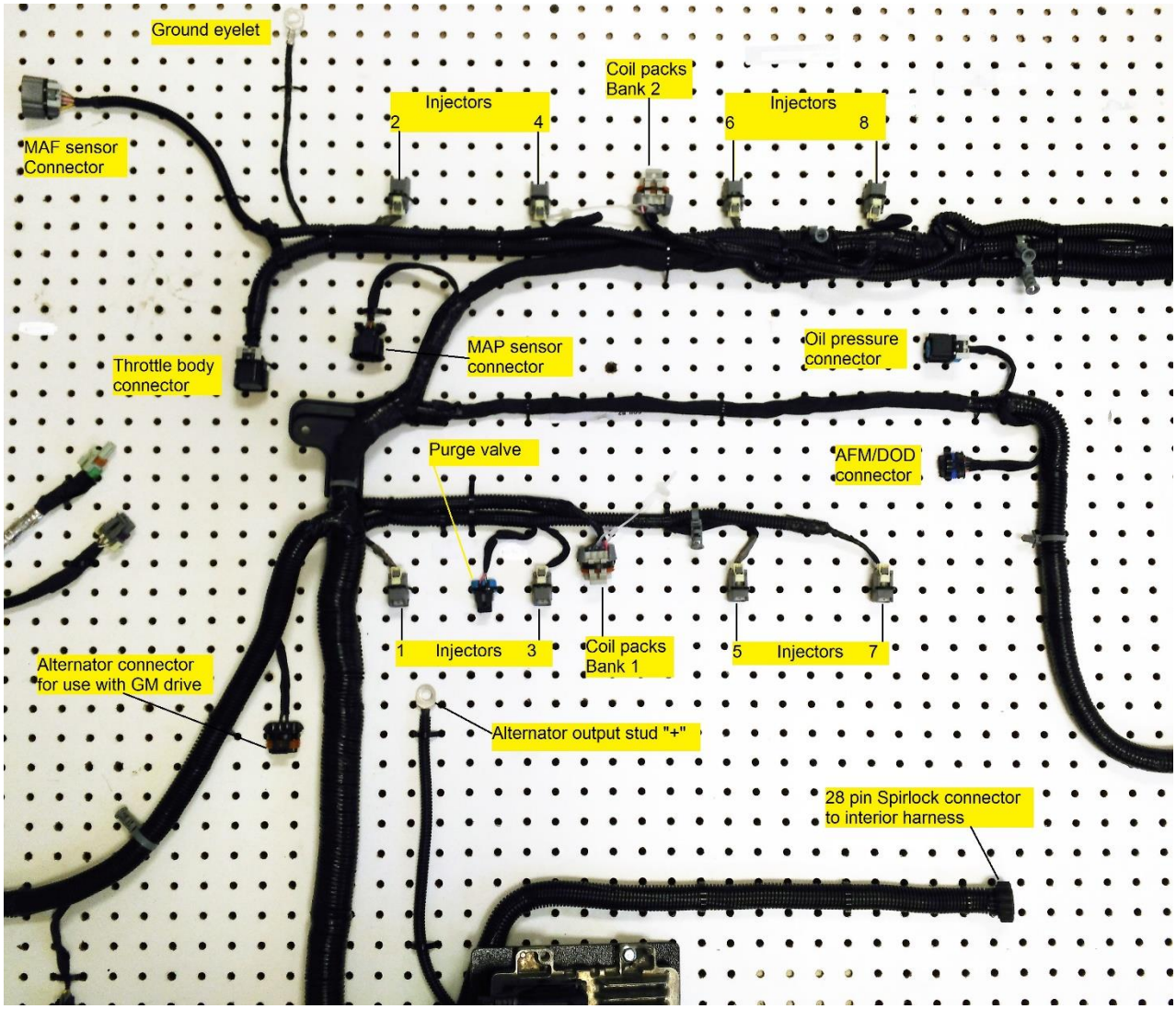
Connect main grounds to the bare head or block. Remove any paint where the ground terminals contact metal. If possible use a star washer between the block/head and ground ring eyelet. Grounds are extremely important to engine performance, spend a few extra minutes here to avoid future issues. Never ground to

the intake manifold or valve cover they are isolated from the main ground distribution. Always connect engine harness grounds to the engine not the firewall or frame.



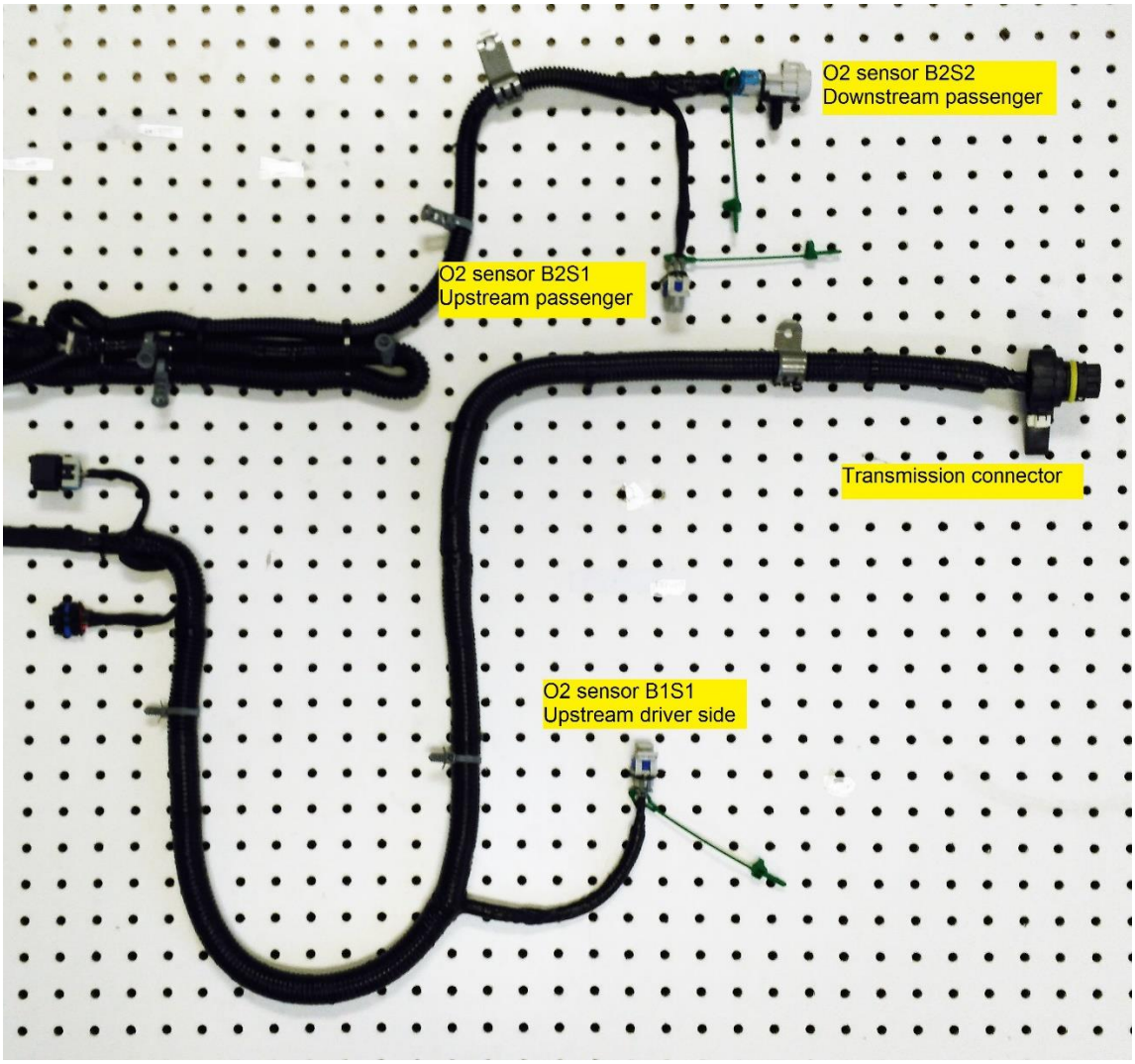
Lower engine

Not all engines will use all the connectors on your harness. For example we include an AFM (4 cylinder mode) connector on most harnesses; if your engine does not have AFM properly tape off or remove the AFM connector.
If running the GM accessory drive vs the Jeep JK drive the connections will be different and we will cover this in a separate section of this manual.



Injectors and coils

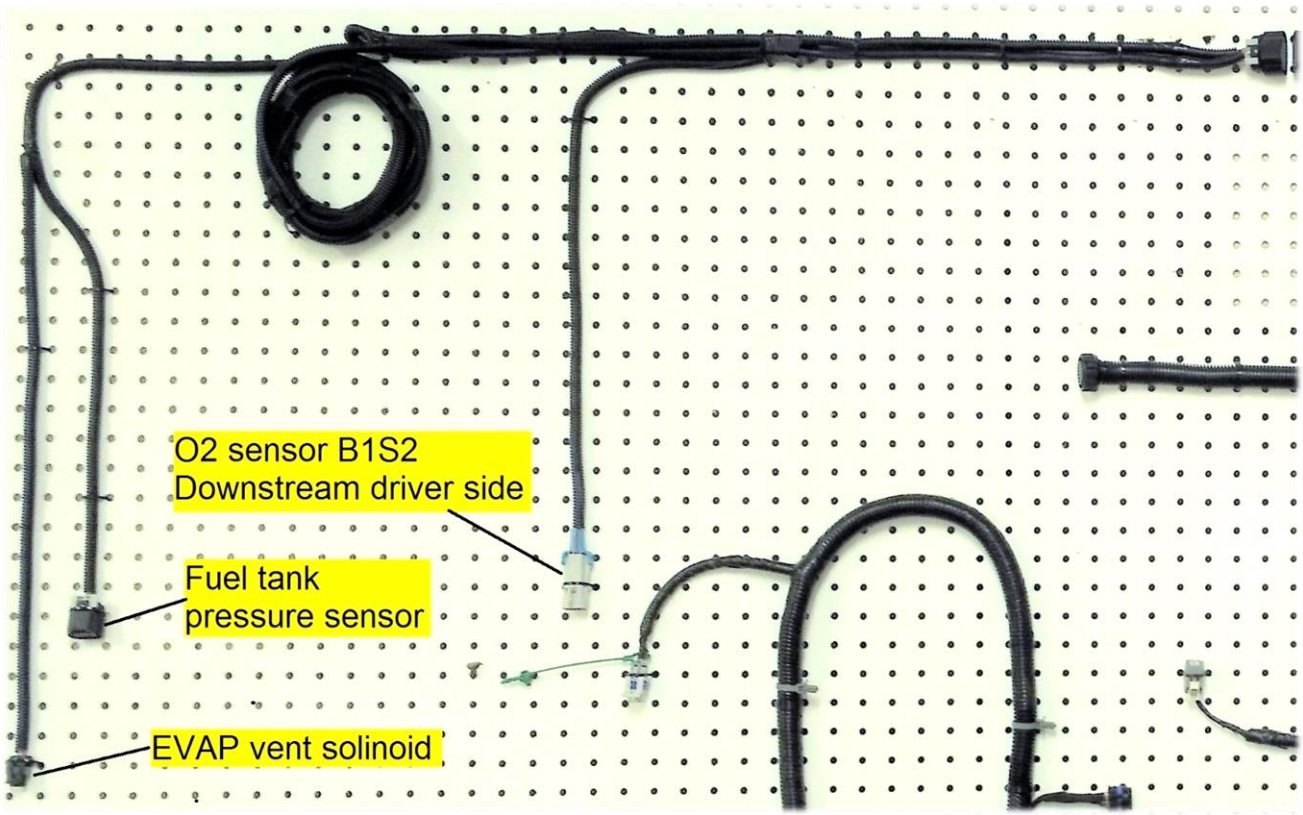
ALWAYS disconnect your negative battery cable first (with ignition off) and connect it last when installing the battery. Please run a good quality battery, do not try and save a few dollars on a discount battery. Modern computers rely heavily on proper and stable power and ground distribution. Inexpensive batteries can lead to problems due to cell voltage error and internal resistance. We cannot recommend the new generation of Optima batteries with our swap. If you have a new generation Optima battery we recommend you replace it; if you call tech support one of the first questions we will ask is “are you running an Optima battery”. We prefer traditional batteries and have had good results with AC Delco, Sears and Carquest batteries. If you must have an AGM battery we suggest Odyssey, Northstar, Sears Platinum or Carquest.

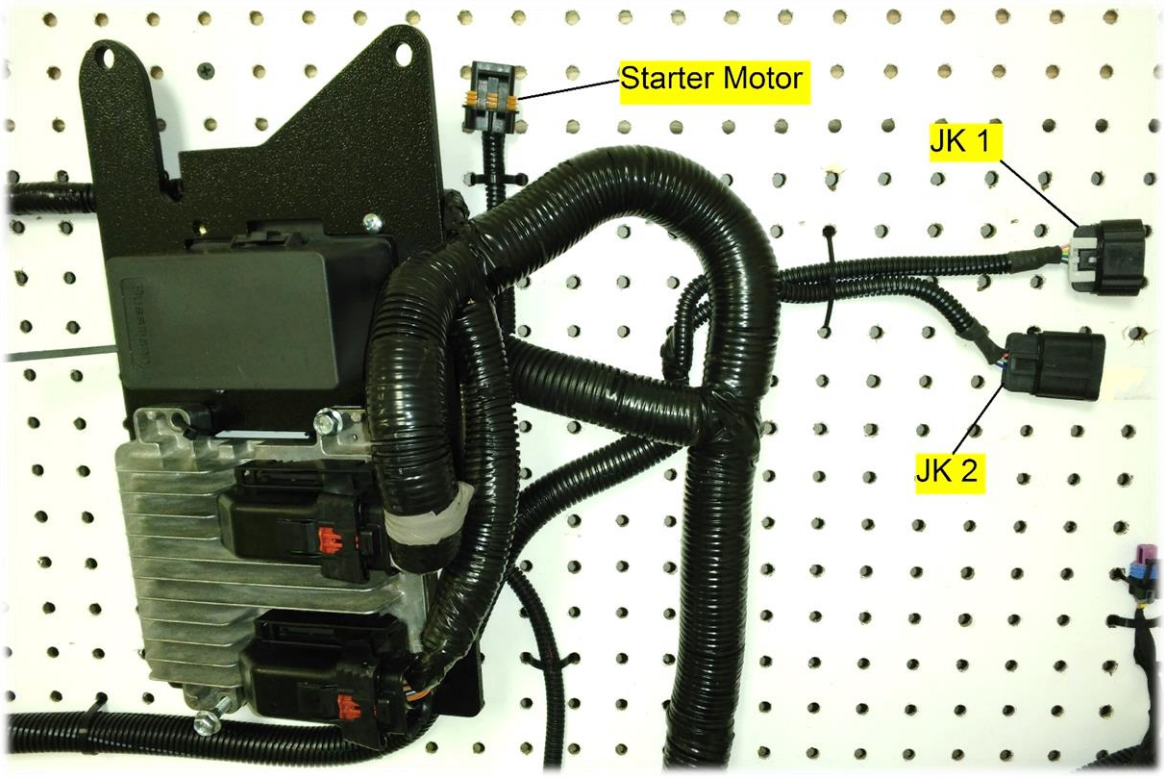


Transmission and O2's

The MoTech LS JK harness is designed to be modular. The main LS JK harness contains most of the engine performance connectors such as injectors, coils, engine sensors….. There are a few breakouts off the main harness:

- Main harness to interior harness
- Main harness to rear chassis
- Main harness to JK 1
- Main harness to JK 2
- Main harness to rear chassis


O2 sensor B1S2
Downstream driver side
Fuel tank
pressure sensor
EVAP vent solinoid


Starter Motor
JK 1
JK 2

Harness installation:

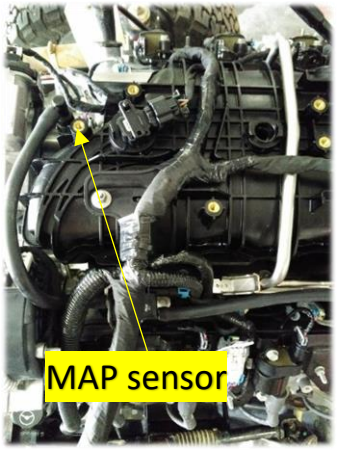
We recommend you install the MoTech harness after the powertrain is in the chassis but before the body drop. It is extremely important you route the harness properly. Here are some suggestions:

- Always route the harness away from heat sources, this includes:
    1. Exhaust system.
    2. Cooling system, the steam port on the front of the engines gets very hot and will melt wires.
    3. You can route O2 sensor wires above heat shields and away from the converters.
- Make sure connectors are dry before assembly and run dielectric grease.
- Never run wire next to a sharp edge.
- Never stretch the harness to fit, if required lengthen the wires to relieve stress.
- Never have “open” or nom terminated wires exposed, properly seal them off.
- Run a star washer between the terminal and block on all high current circuits.
- Avoid the new style Optima batteries.
- Double check critical connections – Battery, TIPM and block grounds.

Installing the wiring harness properly is critical to a reliable swap. We suggest you lay your LS JK harness out prior to installation and identify all the connectors to get familiar with them. If you engine does not have **AFM or VVT** you might find those connectors are included on your harness and must be terminated properly.

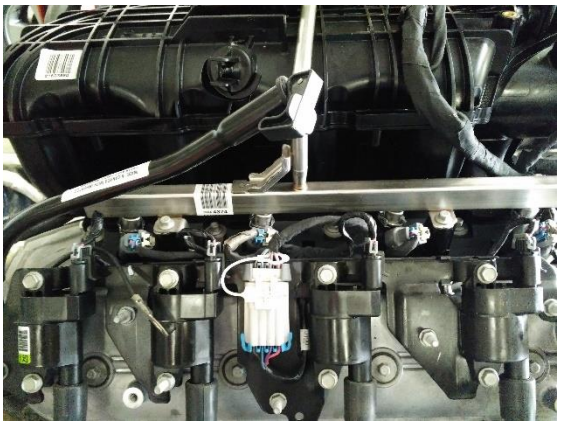
If you are running a **2007 or 2008** engine the oil pressure sensor should be replaced with the larger 2009 + oil pressure sensor so it will plug in. Also the MAP sensor connector will need to be replaced to the Delco style MAP, please call 725-502-8507 for more information.

1) Lay the harness on top of the intake, notice the ECM/Bussman are located on the driver side. On truck engines use the “Y” molded into the intake as your starting point. Notice the main trunk comes in from the driver side, the leg with the transmission connector goes rearward and the passenger side injectors fall off to the passenger side. On truck engines bolt the harness bracket to the top of the intake as shown in figure 1. On LS3 style engine the harness will route just behind the throttle body as shown in figure 2. On LS3 engines you can route the harness that runs behind the throttle body below the throttle body for a cleaner appearance but route it away from the steam port crossover tube which gets very hot.

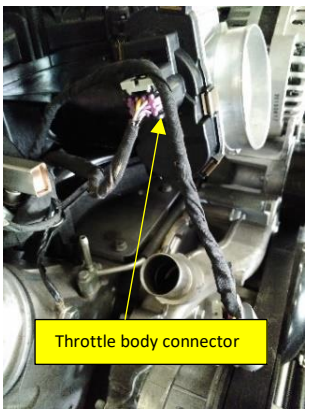


2) Plug in the MAP sensor, this will assure you have the harness oriented properly.
3) Plug in the injectors and coil pack connectors on each side. Note: Bank 2 has the ground which bolts to the front of the head accessory drive bolt holes. Never use the intake or valve cover for a ground connection, always use the engine block or cylinder head. Use a washer under the ring eye terminal on important grounds: be sure to clean any paint or off where the terminal sits.

wire manifold star debris

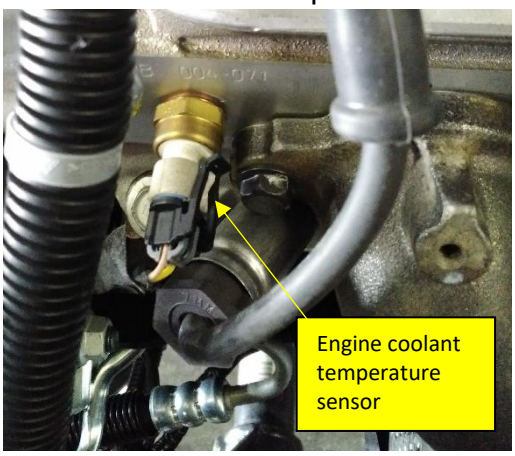


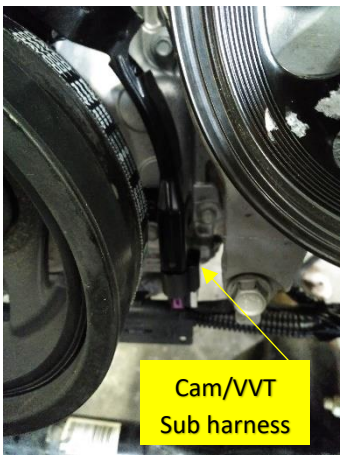
The throttle body connector is part of the TAC (throttle actuator system. This connector should be installed only once with dielectric sure to seat it properly, GM does not recommend removing this unless necessary. The throttle body uses two throttle position determine throttle position. These TPS sensors work in opposite directions and share a ground. If this ground gets weak the two TPS separate throwing you into one of many reduced power modes. So it to connect the TB properly and do not run the TB harness against port or radiator hose; you may tie it to the valve cover breather tube.

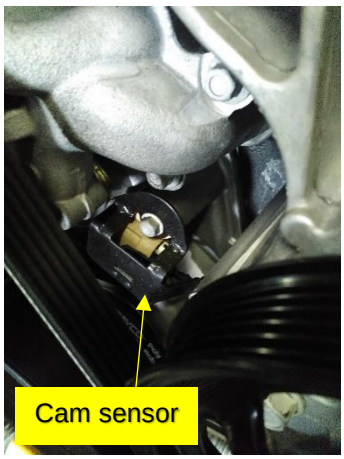


control) grease. Be connector sensors to voltage signals will is important the steam

4) Drop the branch that goes to the Crank sensor, knock sensors and cam sensor down the driver front head. Connect the GM coolant temp sensor on the front of the driver head





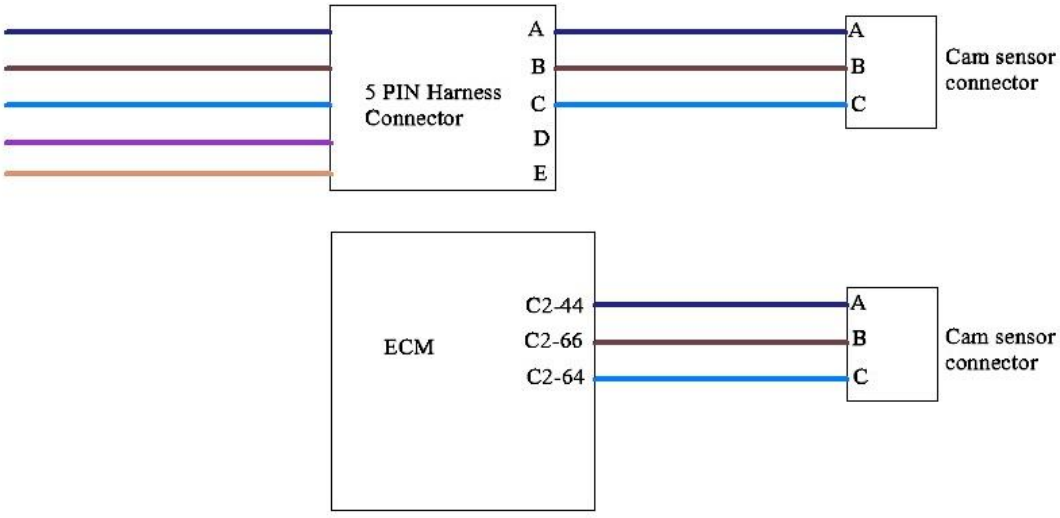


5) It's easier to make the connections underneath when the vehicle is lifted. If you do not have a lift you may do them now. If you have a harness guide for the front of the oil pan attach it now.

6. Connect the VVT/Cam sensor connector to the sub harness located at the front driver side of the oil pan. Now is a good time to talk about this connector. GM has installed a sub harness for the cam sensor and VVT solenoid if your engine is so equipped. The reason is once the harmonic balancer is installed it is difficult to access these connectors so this sub harness brings the VVT and cam sensor wires to an easy access point. If you are running an engine with VVT and AFM you will have a 5 pin connector at the lower front of your oi pan, just plug in our harness.

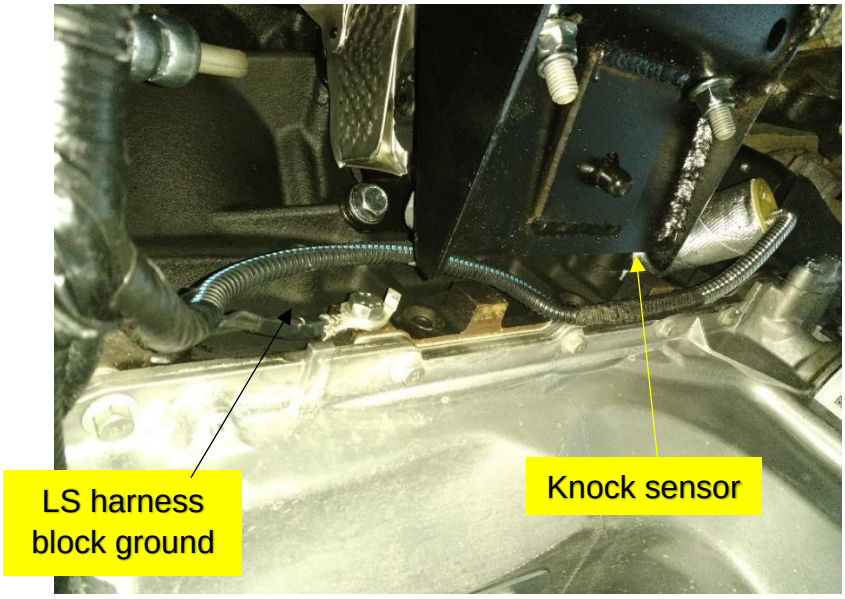
If you have an LS3 or engine without a VVT solenoid you may only have a 3 pin connector at the bottom front of your oil pan so our 5 pin production connector will not connect. You have 2 options to connect your cam sensor:

- First is purchase a GM 3 to 5 pin adapter cable part # 19256607 - Cam Sensor Jumper Harness. This harness just plugs into the existing connectors which is easy but a little bit messy so the second option is:
- Cut off the 5 pin connector on the end of our harness and wire the cam sensor directly on to out harness. This cleans up the wiring for a neater appearance. You must remove the existing cam sub harness and cut off the cam sensor connector. If you look closely at the connectors you will see letters molded into the plugs A B C. You will connect A to A, B to B and C to C in for the three cam sensor wires. Secure the 2 remaining VVT solenoid wires and tape to harness. Always stagger cut wires so they are not adjacent to each other which could cause a short. We prefer to use marine heat shrink end caps on all exposed wire ends; marine heat shrink has glue which seals the wire end.
-

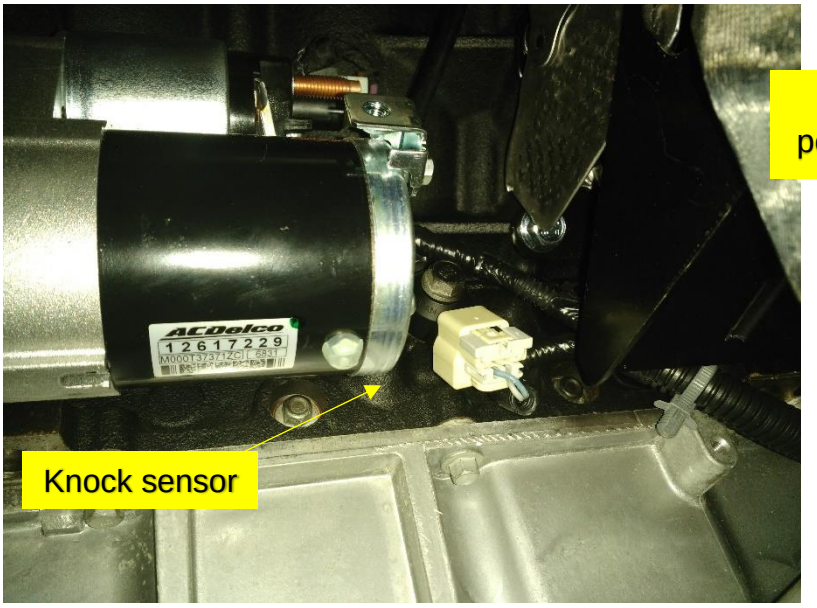


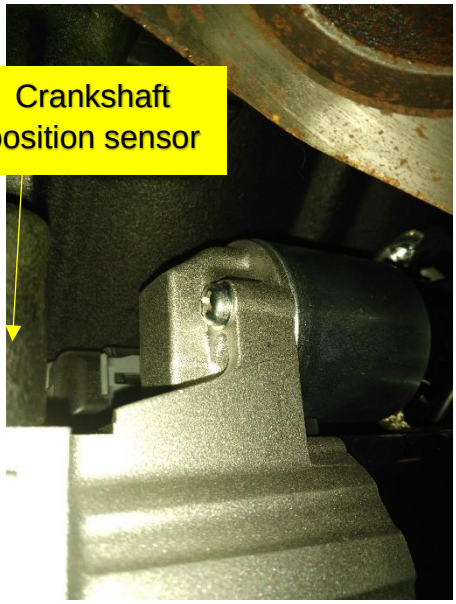
7. Attach the harness ground to the block securely. Clean the block to bare metal for good contact. If your ring eyelet does not have a star washer built in add one between the block and the ring eyelet. Apply dielectric grease to the driver side knock sensor connector and attach. The knock sensors are held on with one bolt and can be rotated to the best position to route the wires. Once you have it where you want

it tighten the knock sensor according to the specifications in the appendix. A loose knock sensor can cause issues. We might mention here if you are running headers, have an exhaust leak or any metal to metal contact it could cause a false knock and reduce performance.



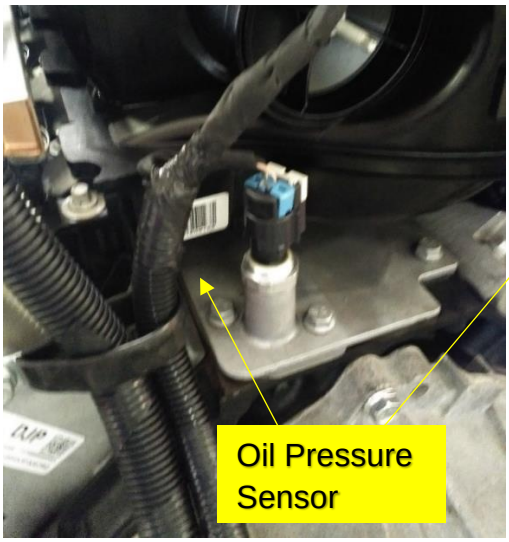
8. On the passenger side of the block attach the knock sensor and crankshaft position sensor. The crankshaft position sensor is behind the starter motor so try and connect it before installing the starter.

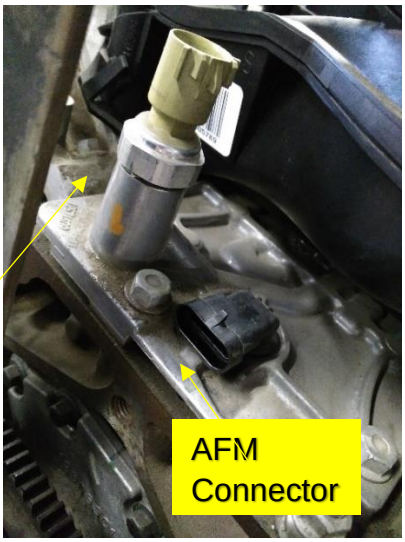




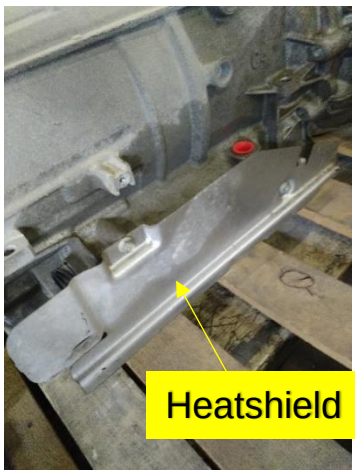
9. Now we will run the rear leg of the LS harness coming off the “Y” at the top of the intake. If you have an LS3 the “Y” is not on the top of the intake but routes along the fuel rail. Run the rear harness over the top of the intake to the oil pressure sensor. As mentioned prior if you have a 2007-8 engine you will need to

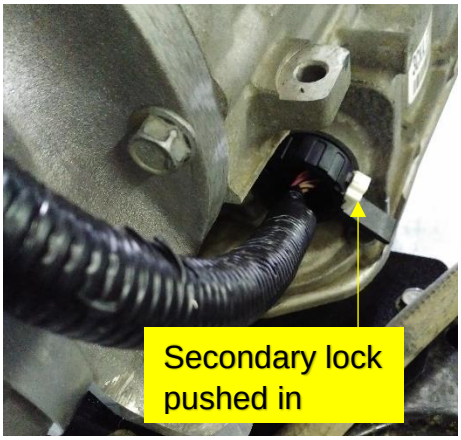
replace your oil pressure sensor to the large 2009+ sensor. If you have AFM plug in the small flat 5 pin AFM connector now.

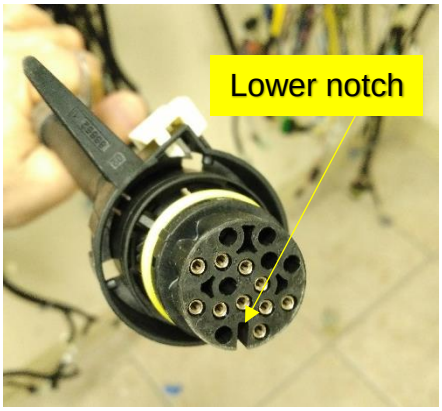


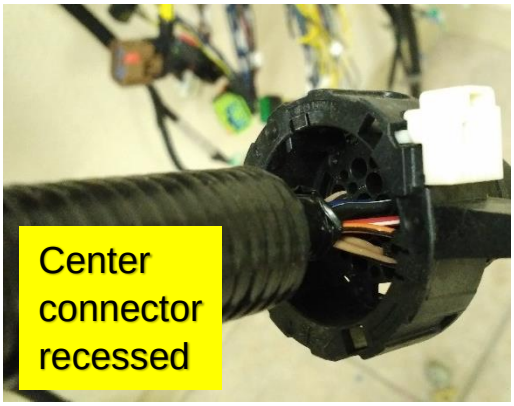


10. Continue running the rear harness down the back of the transmission. You may use an Adel clamp as shown in the picture above; however we recommend you do not excessively tie down the harness every few inches, the harness needs to move with the vibrations and movements of the engine. Drop the transmission connector to the passenger side and insert into the transmission connector. It is very important you seat the transmission correctly, if you don't the connection between the TCM pins and the harness connector will not be made. The transmission connector has a locking ring that is rotated to pull the connector into the TCM connector. If you look closely at the transmission connector you will see a notch at the bottom, this is oriented to the bottom of the transmission connector. Push the connector in with the locking ring at the 1 O'clock position, continue to push inwards and rotate the locking collar to the 5 O'clock position. When seated properly, and this is important, the center portion of the transmission connector will be recessed about ¾" below the locking collar rotated to the correct lock position you can push in the secondary white lock into the locking collar. If this secondary lock does not push in easily double check the connector is seated properly. As with all connections use dielectric grease on the connector. Be sure to keep the transmission connector away from the exhaust, we have seen the hot transmission wires burn when even a couple inches away from a heat catalytic converter. We recommend you run the GM transmission shield if your transmission does not already have one.









Interior wiring:

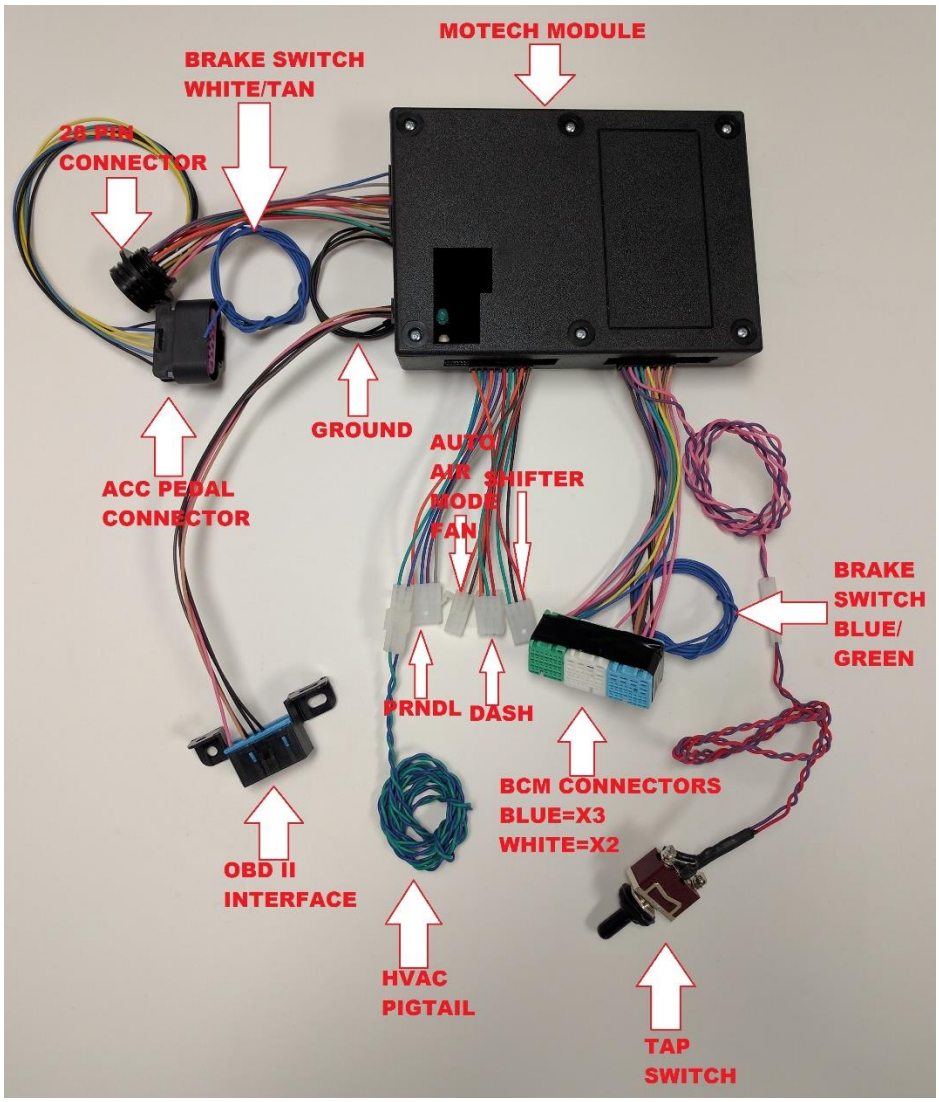
Interior wiring is dependent on which generation MoTech kit you have. If running the Gen IV MoTech module with CAN technology you will not have many of the connections shown. The pictures illustrate a Gen IV MoTech module without CAN so you can see all the connectors available. You may not use all the connectors the MoTech module offers in your application. For instance Automatic climate control became available in 2011 and there is an extra plug on the MoTech module to control the fan and blend door modes, early JK's and later JK's with manual climate control will not use this connector.

Another differentiation is the PRNDL connector. The PRNDL (park, reverse, neutral, drive, low) connector is a flat 4 pin Molex connector with Yellow, Blue, Purple and Grey wires. Each wire serves a function depending how the MoTech module is programmed. The MoTech module can support the following SLP's (shift lever positions):

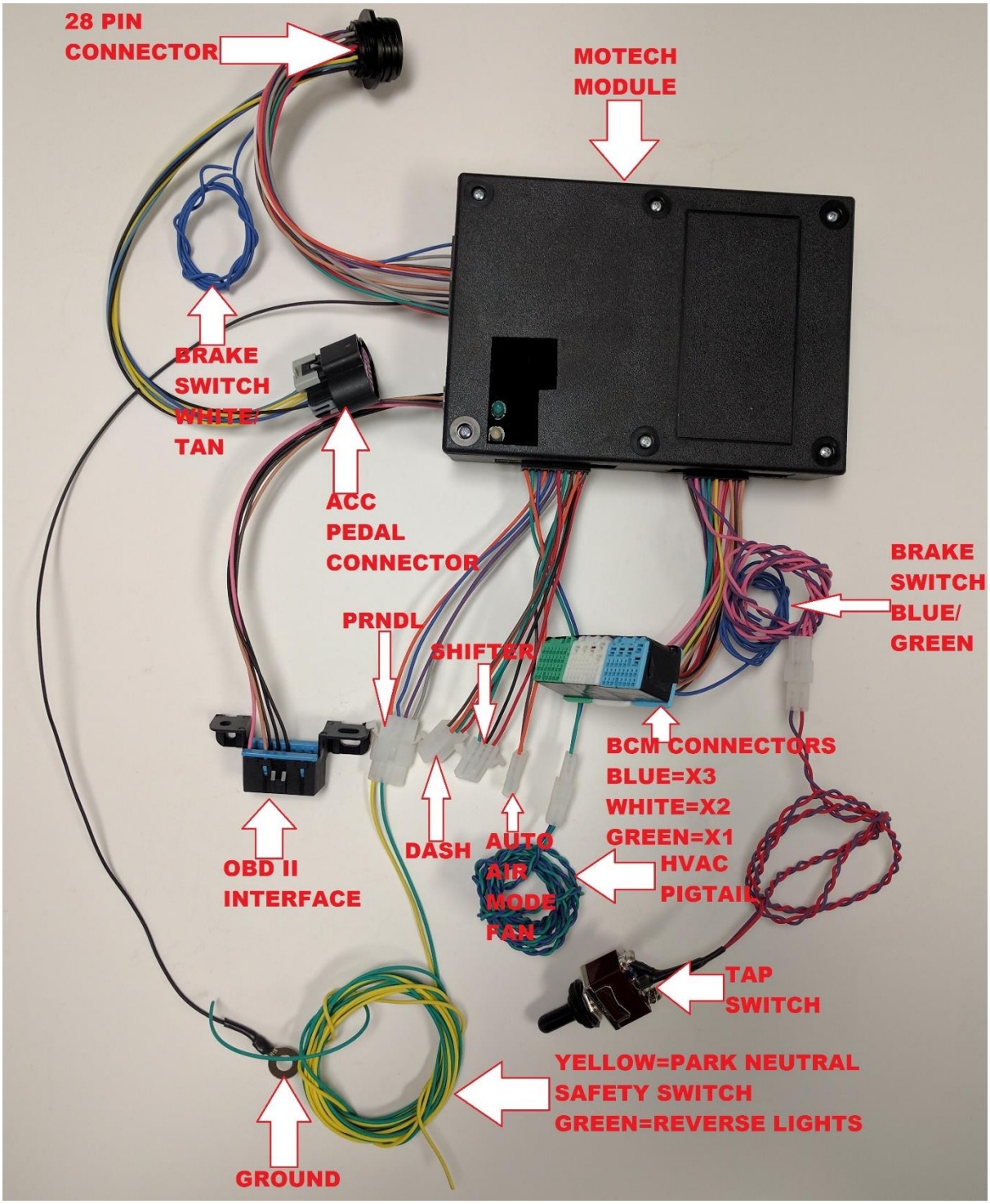
- 6 position automatic standard JK shifter from 2007-2011. This is the standard JK automatic shifter for use with the 4 speed 42RFE transmission.

- 4 position automatic bumpshifter for use with a late model bumpshifter in a 2007-2001 JK. This will allow you to fit a 2012+ JK bumpshifter to an early JK and maintain proper neutral safety, reverse lights, ESP modes and bump (tap) shift.
- For 2012+ JK automatics the PRNDL connector is not used since the stock automatic shifter contains an SLP.
- Manual to automatic conversion. If converting your JK to an automatic from a manual transmission you have this programming. You will only need to program park reverse and neutral with this configuration which will give you neutral safety and reverse lights. Please refer to the appendix when converting from a manual to an automatic for install instructions and a parts list.

If running the Gen IV+ MoTech module with CAN you will not need to use the PRNDL connector in most applications.



Automatic


28 PIN
CONNECTOR
MOTECH
MODULE
BRAKE
SWITCH
WHITE/
TAN
ACC
PEDAL
CONNECTOR
BRAKE
SWITCH
BLUE/
GREEN
PRNDL
SHIFTER
BCM CONNECTORS
BLUE=X3
WHITE=X2
GREEN=X1
OBD II
INTERFACE
DASH
AUTO
AIR
MODE
FAN
HVAC
PIGTAIL
TAP
SWITCH
YELLOW=PARK NEUTRAL
SAFETY SWITCH
GREEN=REVERSE LIGHTS
GROUND

Manual

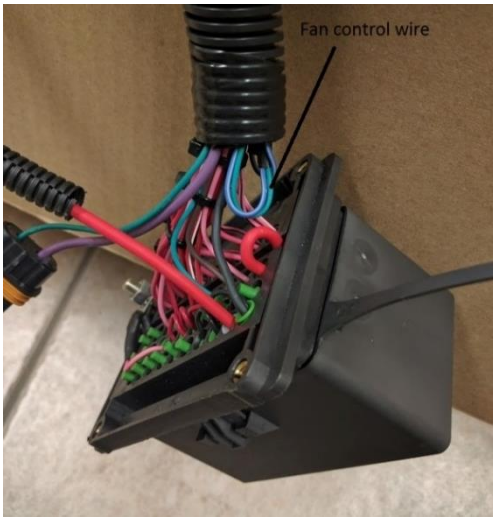
Interior harness components:

- Data link connector, you will attach this to the JK data link connector.
- Accelerator pedal connector.
- 28 pin interior to main LS harness connector; or, bulkhead connector. This connector makes it easy to separate the body from the chassis. Note: We have used this 28 pin Spirolock connector for a couple years now and it is very reliable. This is a high quality connector with gold plated terminals. Since the accelerator pedal signals run through this connector it is very important the connection is perfect and corrosion free. We suggest you add a little dielectric grease to this connector. If you have an early MoTech kit with the 15 pin Molex connector you may consider cutting it out or replacing it with this 28 pin connector, please call us for details.
- PRNDL connector. Flat 4 pin connector used as described above.
- Tapshift connector. This 2 pin connector allows you to connect the switch of your choice for tapshift operation. MoTech supplies a 3 position momentary toggle switch which we feel works well when mounted on the steering column. This connector will also support the bumpshifter if you have one. Custom tapshift options are available please call for information.
- HVAC connector will be used for AC control. This 2 pin connector will go to the instrument cluster or HVAC controller depending on the year of your JK.
- Automatic climate control connector will go to your 2011 or newer HVAC control head to operate the automatic climate control modes; if you do not have automatic climate control you will not use this connector.
- Shifter connector is a 3 pin Molex. This connector goes to the shifter and is not used in 2012 or newer automatic JK’s.
- Instrument cluster connector is a 6 pin Molex and is used for various functions. If you have a Gen IV MoTech module with CAN you will not use this connector.
- Brake switch signals. GM runs two independent brake switch inputs for safety. Both these wires will go to the brake switch, if you have a Gen IV MoTech module with CAN you will not need to use these wires.
- Ground eyelet goes to either ground stud in driver foot well.
- BCM connectors plug into the GM BCM supplied.

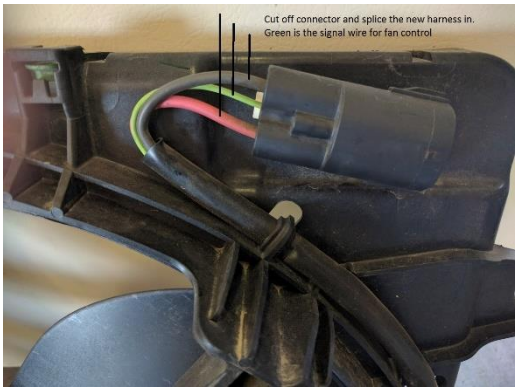
Appendix:

Fan Upgrade Wiring Instructions

The Pentstar Fan is controlled by a pulse width modulated signal. The E38 LS engine computer will need to be programmed to control the fan. Once the GM E38 ECM is programmed it will output the correct signal to control the fan. This signal wire is in Connector 1 Pin 58 of the E38 computer. The wire color is green if it is already pinned. On newer MoTech engine harnesses there is a pigtail for this fan control, it is tucked in the loom at the fuse box.



At the original fan connector there will be three wires. The large 10 gauge wires are power and ground. These will get spliced into the upgrade wiring harness to the butt connectors.
Next the signal wire will be spliced in as well. After completing these splice connections run the signal wire to the E38 computer. Next attach the ground and power fan wires to the vehicles battery.
Now that the wiring is completed test start the vehicle. The fan should start running within 30 seconds at 40% power. As the temperture increase above 212f the fan will increases proportionally up to 100% .



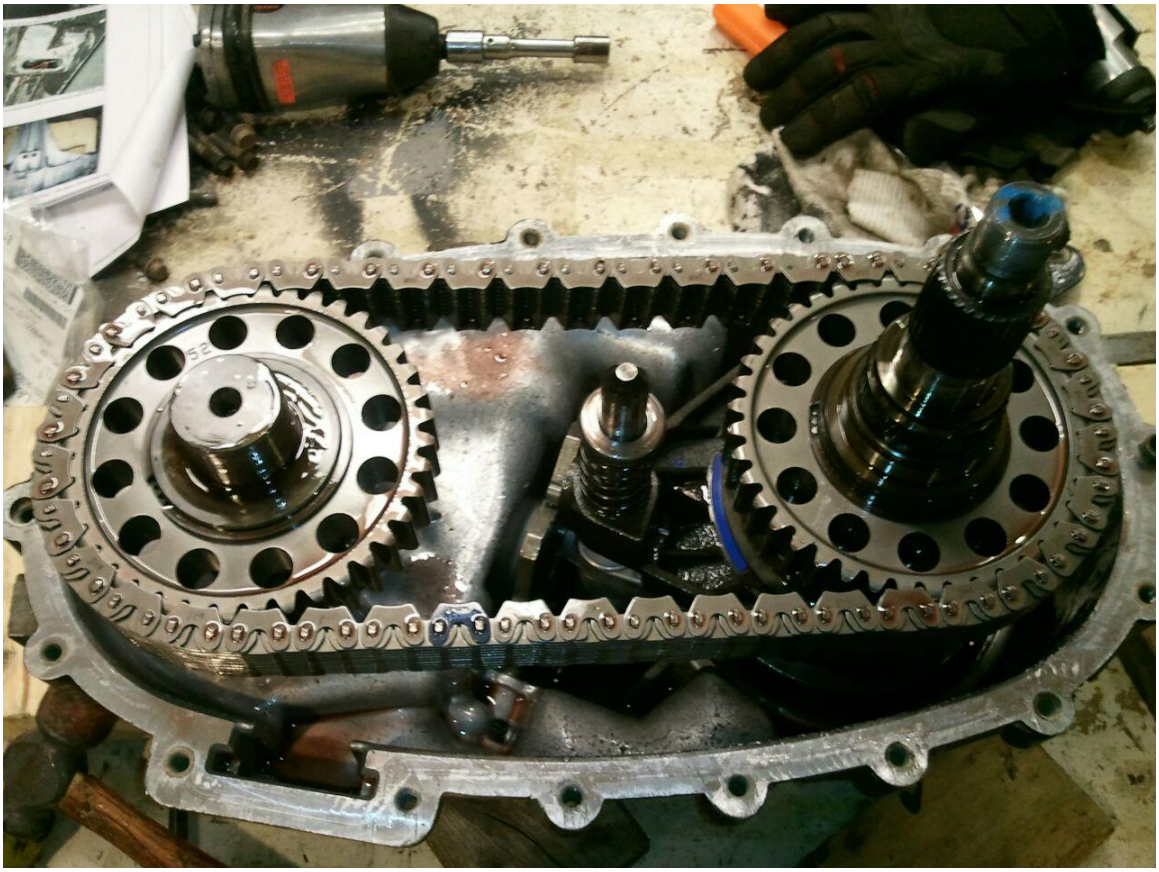
Wiring Diagrams:

241J input gear swap submitted by a customer.

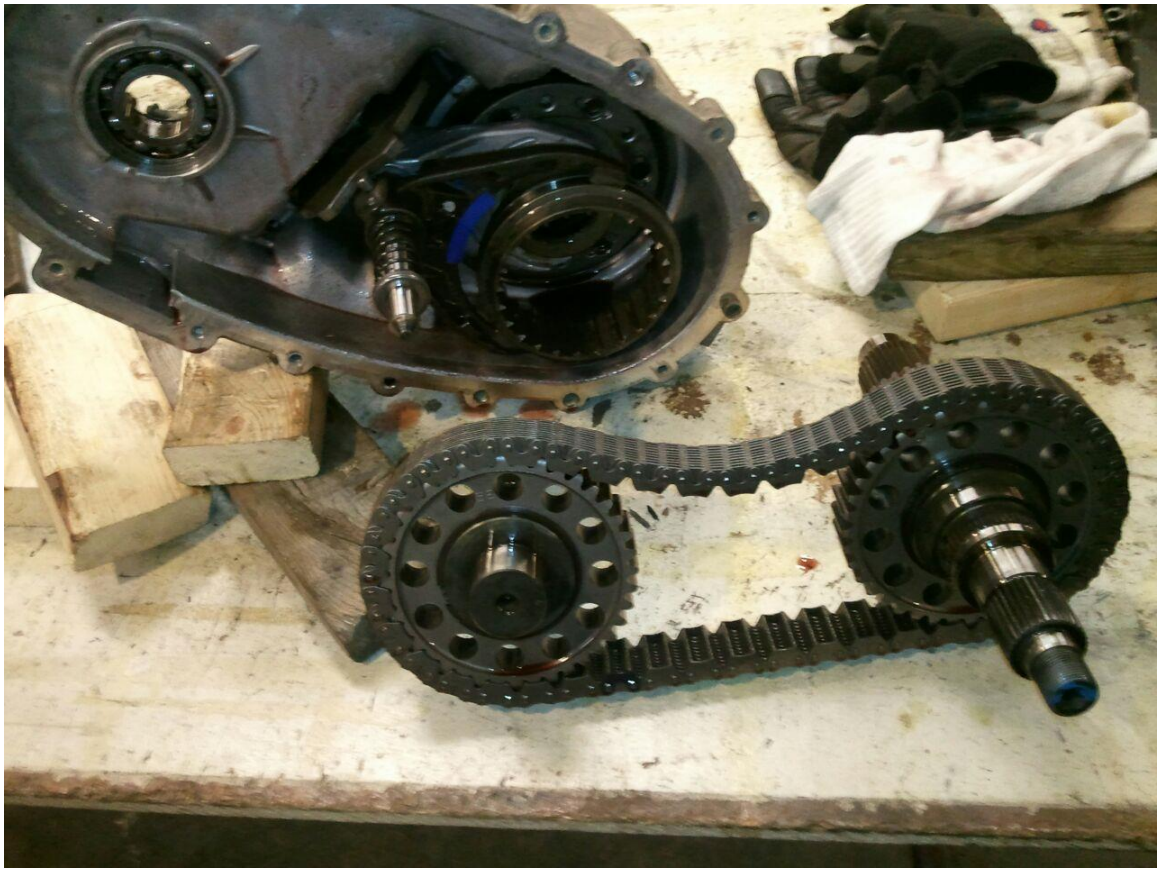
Things needed are new seals, a good case sealant other than RTV such as form a gasket, good snap ring pliers, a good grade ATF 4 plus hydraulic fluid - two quarts, seal puller helps and patience.

1. Remove transfer case clean and prop up on a bench or table with the output side up.
2. You can chose to remove output seal cover to replace seal but is not necessary for change out of input shaft.
3. Remove all of the bolts holding the two case half's together.

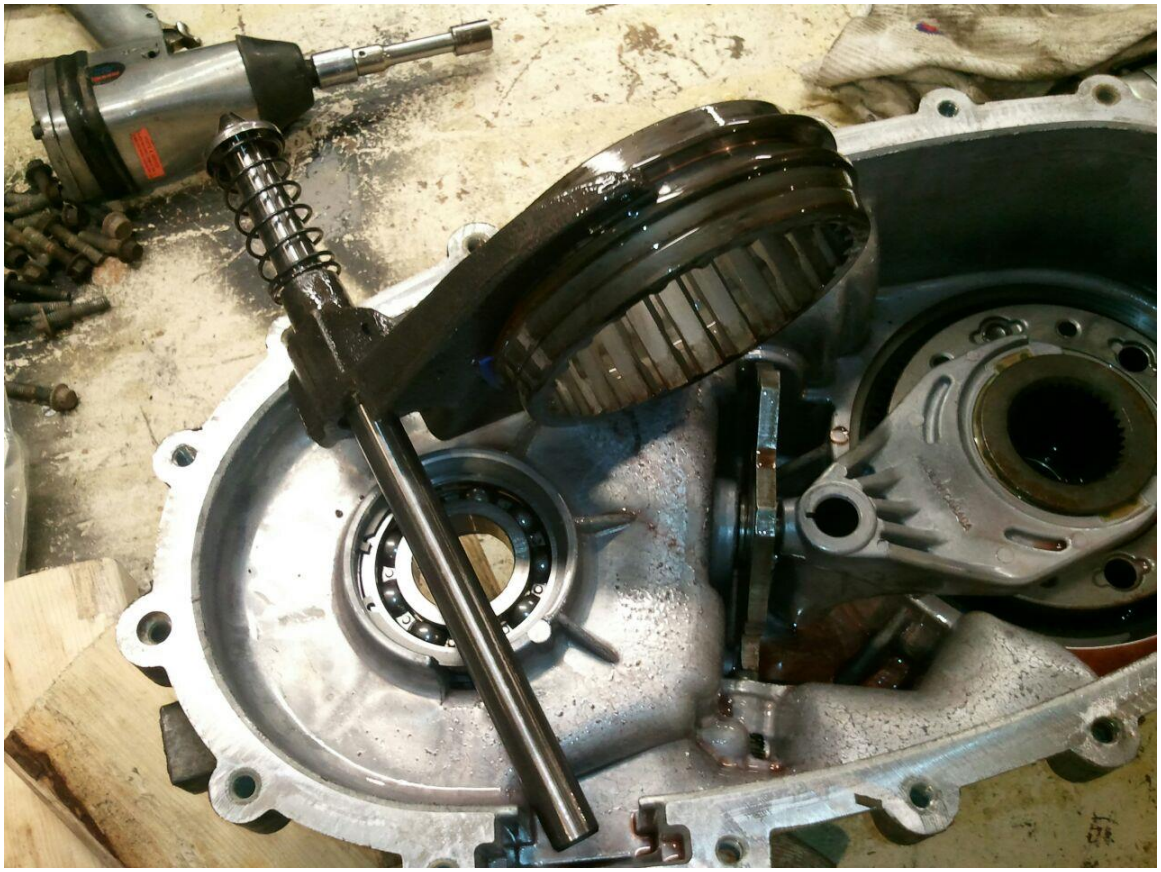
4. Use a piece of wood or if you have a proper spreader to split the case half's. Do not go overboard here and break the case. It does take quite a bit of pressure. Work your way around case and once it starts to let go you can open it easily. Separate the front cover straight up and off the rear case. Reuse wood to seat seals on cases.



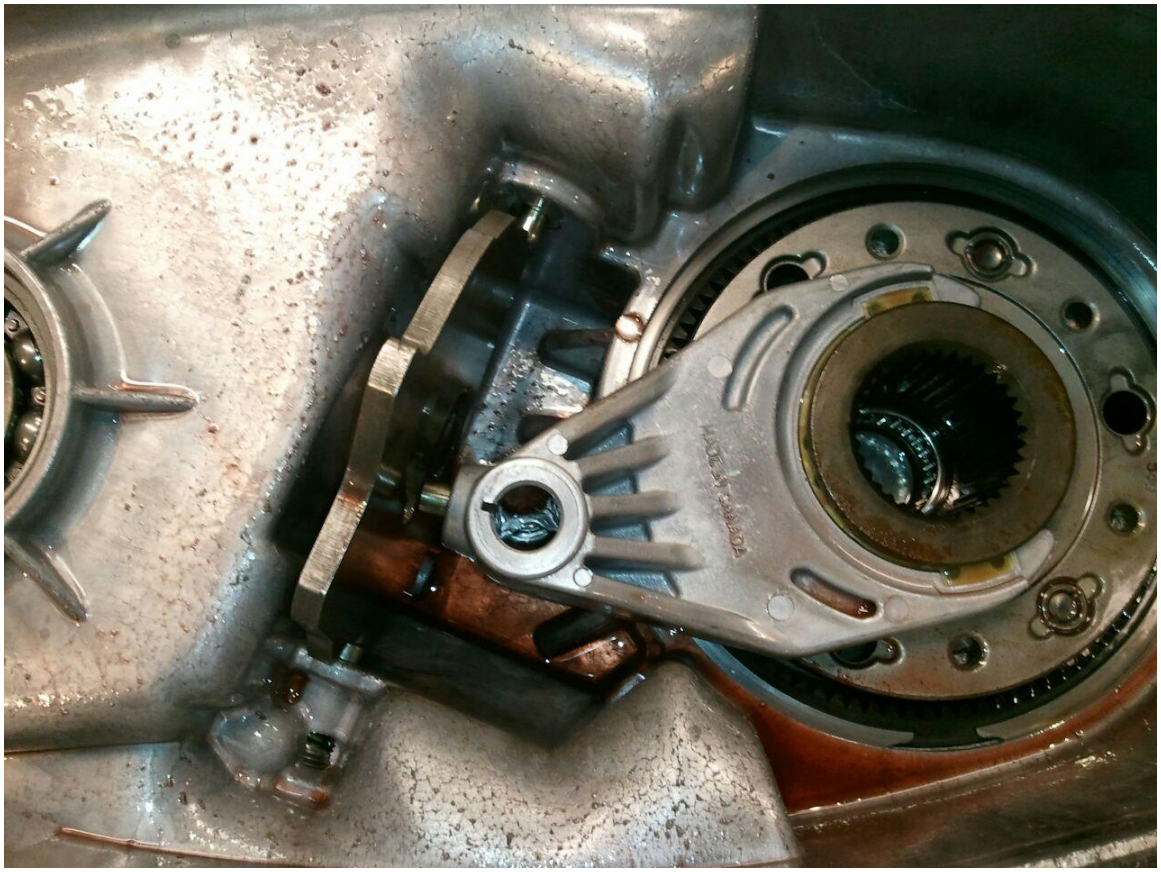
5. This is what you should have now. Note magnet on lower left corner. Clean and put back in slots.
6. Now you can lift straight up and remove output shaft, chain and front output shaft all at once.



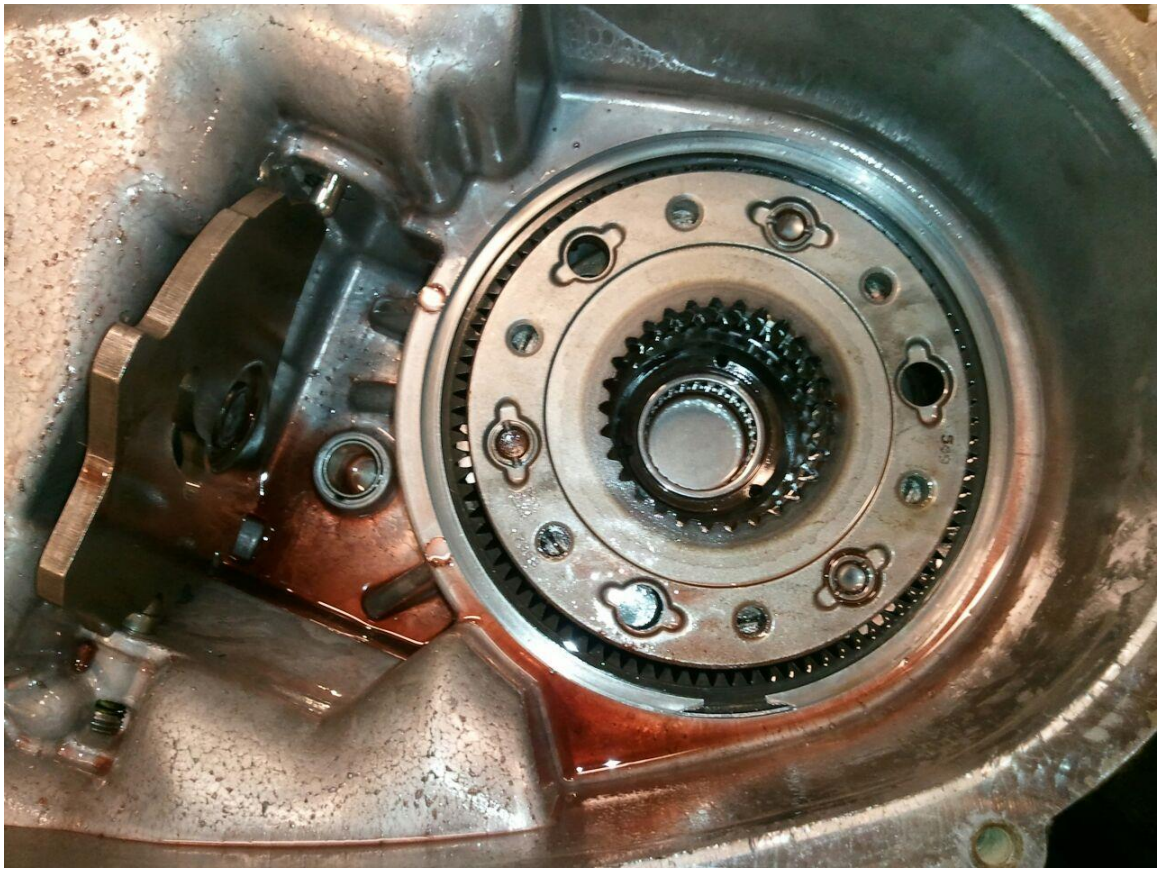
7. Take this whole assembly and set aside in a clean safe place. You will install it the same way you pulled it.



8. Now pull strait out the shift rail shaft with the mode fork and synchronizers. Note spring and retainer on top. Set aside in clean safe spot.

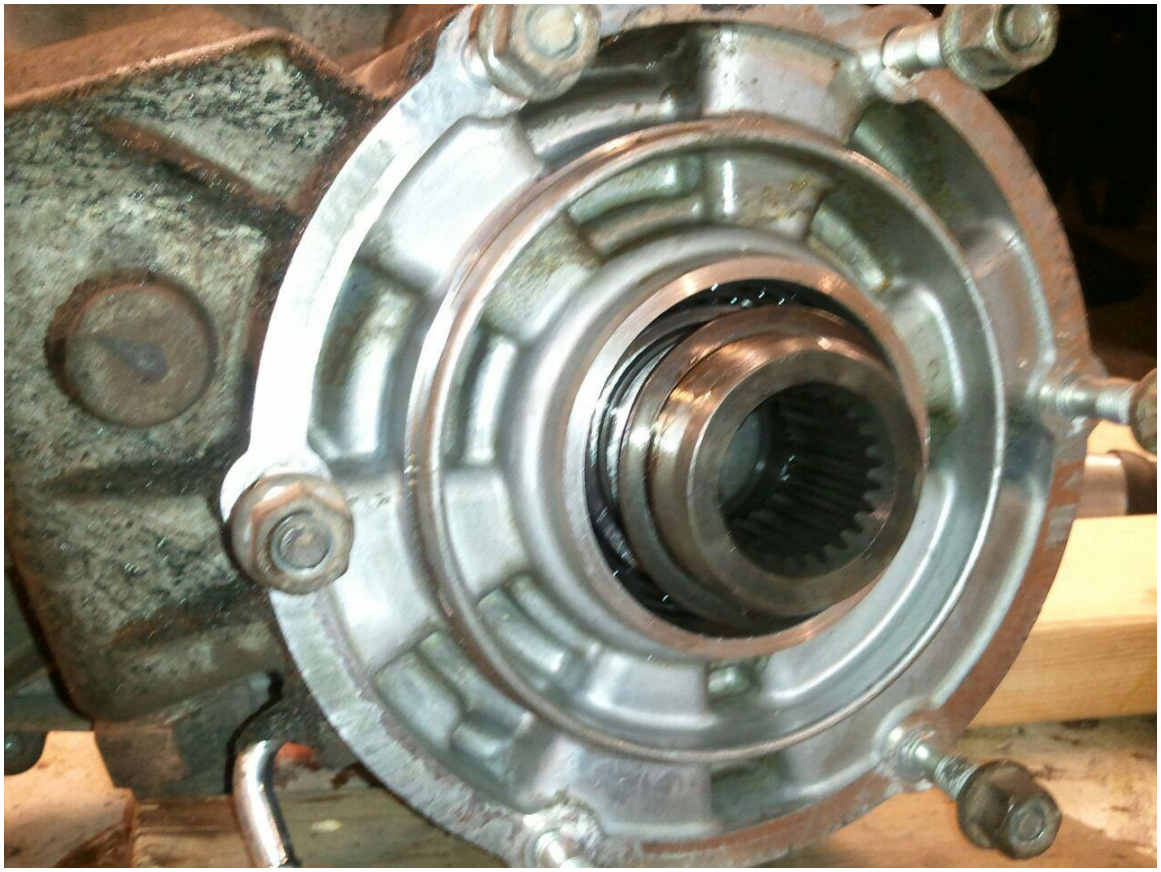


9. Now turn range fork down out of range selector slot and pull strait out. Set aside as before. Below is what you should see now.



10. Now you are viewing the whole planetary with the input shaft in the center.
11. Flip case over and we need to take out the input shaft seal and remove the snap ring holding the planetary into the case. I punched a hole into the middle of the seal and used a seal removing tool to pull out the seal as pictured below.

12. When removing seal it is easier to lay the case on its side to take pressure off of the snap ring and work it off of the end. Now the input shaft and synchronizer should slip out of the case. You may need a rubber mallet to get it moving.



13. Now you should have the synchronizer and shaft out as below.

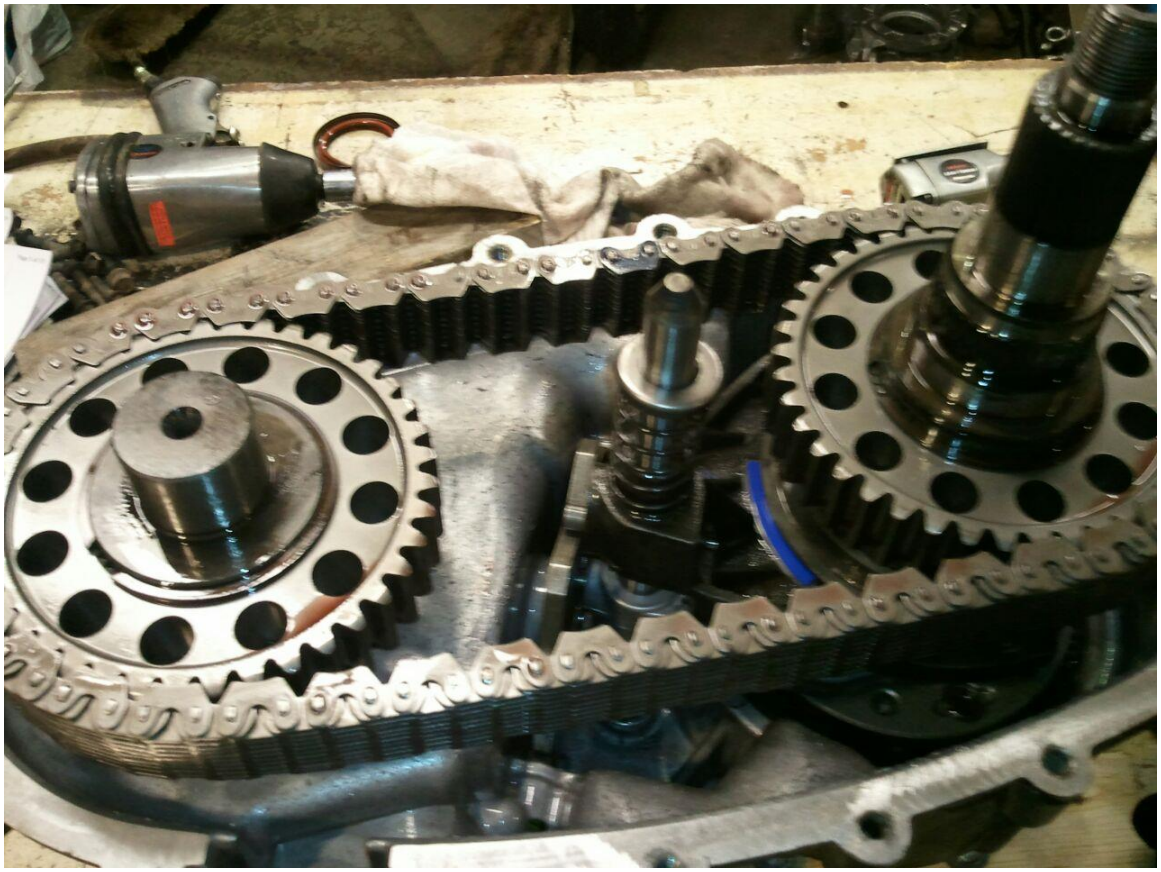
14. Now remove snap ring on top and between input shaft and synchronizer housing seen in pictures below.

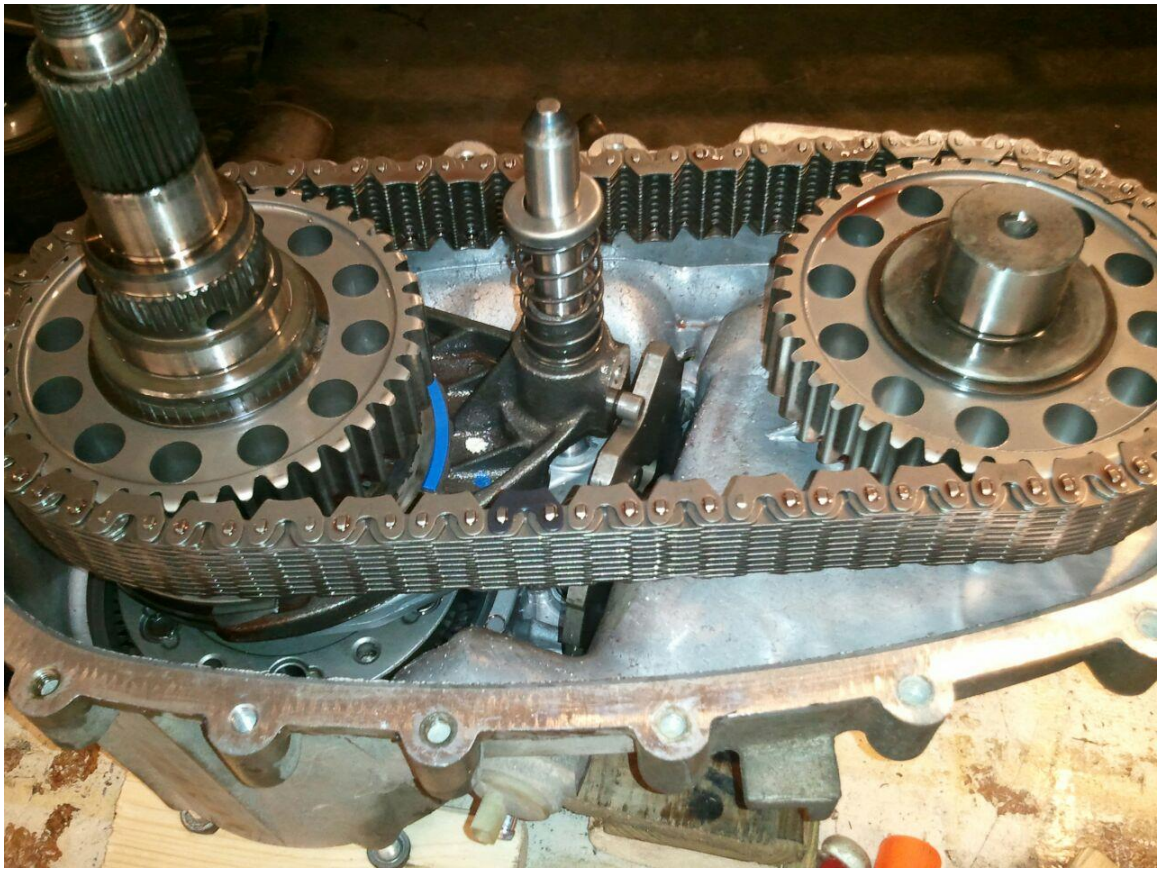
15. Lift out input shaft from synchronizer note index washer on top of input shaft.

16. Take new input shaft and put index washer on and replace into synchronizer. Replace snap ring and double check to make sure it is seated into synchronizer. Now it should look like below.

17. Insert back into housing and put snap ring onto new input shaft. Replace input seal and use the piece of wood to seat seal flush with housing as pictured below.

18. Now flip back over and support. Insert all the shift forks and gears with chain in the opposite order as taken out. Use picture below for reference.





18. Put a bead of liquid gasket around the case as pictured below. Make sure all of the cases are clean and matting surfaces are clean of oil and old gasket material.

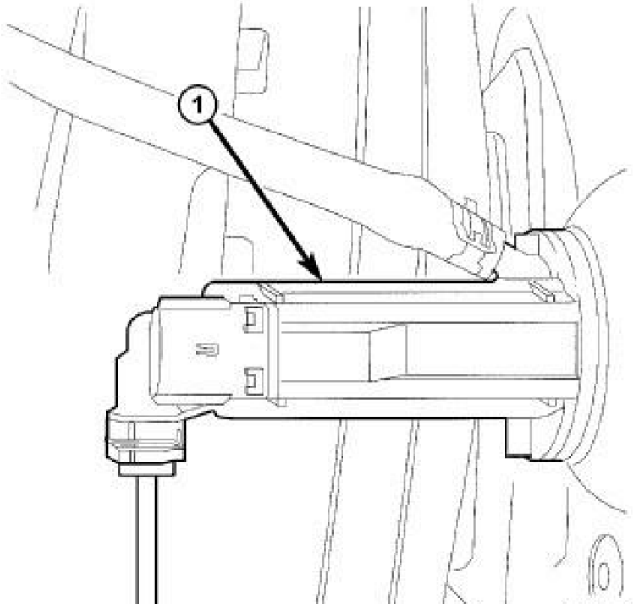
19. Put case half's together making certain to go straight down and not to wedge the bearing on the output shaft. The shift rail shaft and front output shaft go into this case half also so a little wiggling on the front output shaft from the bottom helps center the shaft in case. Make sure it is fully seated so when you put the bolts back in you don't crack the case's.

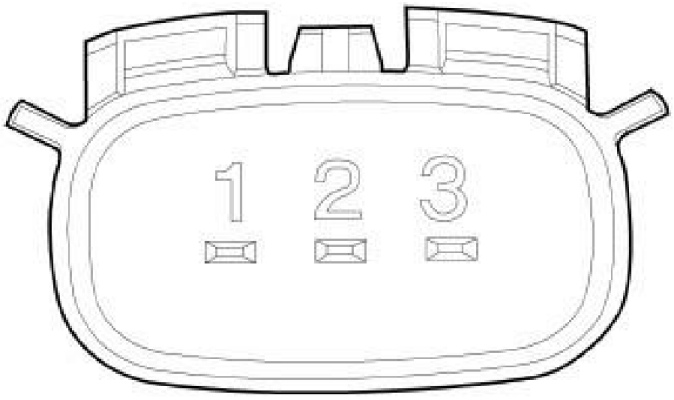
20. I used a small air impact and checked all bolts with a socket wrench. Make sure you see gasket material coming out all around case. Also tighten in a crisscross fashion.
Replace in unit and fill to threads in middle inspection hole. Takes about two quarts.

Manual to automatic conversion:

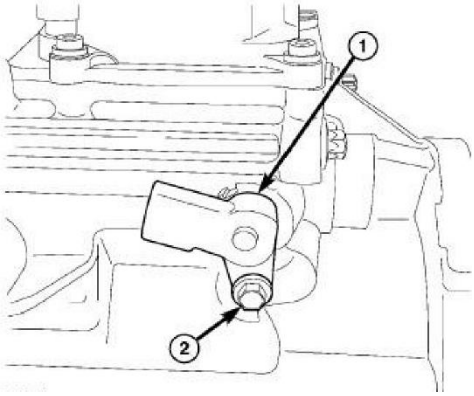
MoTech has supported manual to automatic JK swaps for many years. This section applies to PRNDL control not using our CAN interface but rather a Gen 1-4 MoTech module.

1. Remove the two (or three) pin connector at the clutch master cylinder.





2. Remove the clutch master cylinder from the firewall, you will run the LS interior harness through this hole.
3. Cut off the clutch master cylinder connector, you should have a yellow and black wire.
4. Tape off the black wire it is just a ground.
5. Run the yellow wire into the cab along with the LS interior harness.
6. Next is the reverse switch wire. You will have a single green reverse light wire coming out of your C100 harness if MoTech modded your harness. If MoTech did not mod your C100 harness there will be a 2 pin connector that went to a reverse light switch on the driver side of the transmission.

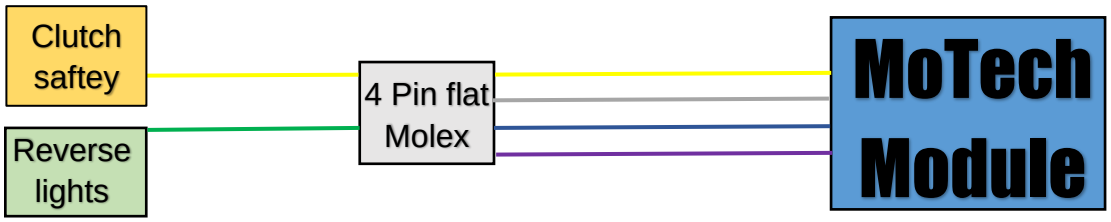


Reverse switch

7. Cut off the green and black wires from the reverse light switch. The black wire is just ground tape it off.

8. Run the green reverse light switch wire into the cab through the clutch master cylinder hole, be sure to protect it with split loom or sleeve.
9. Connect the yellow clutch safety wire and green reverse light wire to the flat 4 pin Molex connector coming off the Gen I-IV MoTech module as follows.

Yellow to Yellow (Orange on early modules)
Green to Blue



10. When the appropriate connections are made please perform a SLP or “shift lever positon” program procedure as follows:

Shift lever position programming:

1.Place shifter in park.
2.Turn ignition to the on position, the engine does not need to be running.
3.Press and hold the small micro button on the **MoTech** module for 5 seconds until the led lights up, release the button.
4.With the shifter in the park position press the micro button momentarily and it will blink indicating it has learned the park position.
5.Move the shifter to the reverse position, momentarily press the micro button and the LED will blink indicating it has learned the reverse position.
6.Move the shifter to the neutral position, momentarily press the micro button and the LED will blink indicating it has learned the neutral position.
Note: if you have a manual to automatic conversion your LED will blink out after neutral is learned and you are done with the procedure.
7.Move the shifter to the drive position, momentarily press the micro button and the LED will blink indicating it has learned the drive position.
Note: if you have a 4 position automatic bump shifter your LED will blink out after drive is learned and you are done with the procedure.
8.Move the shifter to the second position, momentarily press the micro button and the LED will blink indicating it has learned the second position.
9.Move the shifter to the first position, momentarily press the micro button and the LED will blink indicating it has learned the first position.
10.Once programmed the SLP board will retain shift lever position data even if the battery is disconnected.

For safety reasons if you move the shift lever rapidly back and forth, or leave the shifter between gears, the system will go into PRNDL error, you will need to clear the codes to restore PRNDL operation. It is important you clear the codes on the Jeep data connector key on engine off.
If further assistance is required please call 725-502-8507 or email us at info@LSWrangler.com

Jeep Wrangler torque specifications:

Description	N.m	Ft. Lbs	In. Lbs.
A/C expansion valve nut	23	17	-
Backlite hinge bolts	10	-	90
Body isolator mounting bolts *	108	80	-
Body isolator to body nuts	54	40	-
Brake booster bracket nuts	18	13.5	-
Center OCS strain gauge stud nut	45	33	-
Door carrier plate screws	10	-	90
Door hinge pin nut	8.5	-	75
Door hinge to body bolts	28	21	-
Door hinge to hinge bolts	26	19	-
Door latch adjustment screw	3	-	26.5
Door latch mounting screws	8	-	71
Door latch striker bolts	26	19	-
Four door rear seat 40% inner seat back pivot nut	25	18.5	-
Four door rear seat center belt buckle bolt	61	45	-
Four door rear seat cushion pivot bolts	25	18.5	-
Four door rear seat front mounting fasteners	75	55	-
Four door rear seat headrest bolts	8	-	71
Four door rear seat inner latch floor bolts	25	18.5	-
Four door rear seat latch to back frame bolts	45	33	-
Four door rear seat outboard latch floor bolts	25	18.5	-
Four door rear seat rear mounting bolt	75	55	-
Four door rear seat rear mounting nuts	85	62.5	-
Four door rear seat cushion pivot bolt	25	18.5	-
Four door retractor screw	55	41	-
Four door seat cushion pivot bolt	25	18.5	-
Front door exterior handle nut	4.5	-	40
Front door glass run nut	10	-	90
Front door interior handle screw	8.5	-	75
Front seat back assembly bolts	47	34.5	-
Front seat belt anchor bolt	40	29.5	-
Front seat belt buckle bolt	50	37	-

***When body isolator bolts are removed and replaced apply new thread locking compound.**

Front door interior handle screw	8.5	-	75
Front seat back assembly bolts	47	34.5	-
Front seat belt anchor bolt	40	29.5	-
Front seat belt buckle bolt	50	37	-
Front seat belt turning loop screw	40	29.5	-
Front seat mounting bolts	75	55	-
Front seat riser nuts	28	21	-
Half door latch nut	4.5	-	40
Hard top front bolts	8	-	71
Hard top side bolts	8	-	71
Hood catch bracket nuts	7	-	62
Hood catch nuts	15	11	-
Hood hinge to body bolts	24	18	-
Hood hinge to hood bolts	26	19	-
Hood safety catch bolt	11	8	97
Instrument panel center support bracket fasteners	8	6	71
Instrument panel fence line nuts	12	9	-
Instrument panel side support bolts	11	8	-
Lower fender to sill bolts	12	9	-
Manual sifter bolt	33	24.5	-
OCS riser nuts	28	21	-
Outside rear view mirror bolts	13	10	-
Rear door exterior handle nut	4.5	-	40
Rear door glass run bolt	12	9	-
Rear door glass run nut	10	-	90
Rear door interior handle screw	8.5	-	75
Rear view mirror set screw	2	-	18
Seat side airbag nuts	7	-	62
Side step bracket bolts	24	18	-
Side step sill nuts	12	9	-
Soft top pivot knuckle bolts	14	10	-
Speaker pod screws	10	-	90
Sport bar cross bar bracket bolts	19	14	-
Sport bar front cross bar bracket bolts	19	14	-
Sport bar rear bolts	19	14	-
Sport bar rear cross bar bracket bolts	19	14	-
Sport bar side bar bolts	19	14	-
Sport bar side bar to windshield frame bolts	23	17	-

Jeep Wrangler torque specifications:

Sport bar to B-pillar bolts	19	14	-
Steering column opening reinforcement plate bolts	11	8	-
Tailgate exterior handle nuts	4.5	-	40
Tailgate hinge to body bolts	26	19	-
Tailgate hinge to tailgate bolts	20	15	-
Tailgate latch screws	8	-	71
Tailgate stabilizer insert and cup bolts	10	-	90
Tailgate striker bolts	28	21	-
Two door rear seat back frame to cushion bolts	50	37	-
Two door rear seat back latch bolts	45	33	-
Two door rear seat center belt buckle bolt	55	41	-
Two door rear seat cushion to back bolts	50	37	-
Two door rear seat front latch cushion frame bolts	45	33	-
Two door rear seat rear latch nuts	10	-	90
Upper fender fasteners	5	-	44
Windshield frame hinge to body bolts	20	15	-
Windshield frame reinforcement bracket bolts	20	15	-

GM torque specifications:

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Accessory Drive Belt Idler Pulley Bolt	50 N.m	37 lb ft
Accessory Drive Belt Tensioner Bolts	50 N.m	37 lb ft
Active Fuel Management Oil Pressure Relief Valve	27 N.m	20 lb ft
Automatic Transmission Flex Plate Bolts - First Pass	20 N.m	15 lb ft
Automatic Transmission Flex Plate Bolts - Second Pass	50 N.m	37 lb ft
Automatic Transmission Flex Plate Bolts - Final Pass	100 N.m	74 lb ft
Battery Cable Channel Bolt	12 N.m	106 lb in
Camshaft Position (CMP) Actuator Magnet Bolts	12 N.m	106 lb in
Camshaft Position (CMP) Actuator Solenoid Valve - First Pass	65 N.m	48 lb ft
Camshaft Position (CMP) Actuator Solenoid Valve - Final Pass	90 degrees	
Camshaft Position (CMP) Sensor Bolt	12 N.m	106 lb in
Camshaft Position (CMP) Sensor Wire Harness Bolt	12 N.m	106 lb ft
Camshaft Retainer Bolts - Hex Head Bolts	25 N.m	18 lb ft
Camshaft Retainer Bolts - TORX Head Bolts	15 N.m	11 lb ft
Connecting Rod Bolts - First Pass	20 N.m	15 lb ft
Connecting Rod Bolts - Final Pass	85 degrees	
Coolant Air Bleed Pipe and Cover Bolts	12 N.m	106 lb in
Coolant Temperature Sensor	20 N.m	15 lb ft
Crankshaft Balancer Bolt		
• Step 1	150 N.m	110 lb ft
• Step 2	Loosen 360 degrees	
• Step 3	80 N.m	59 lb ft
• Final Step	125 degrees	
Crankshaft Bearing Cap Bolts		
• M8 Bolts (1-5) - First Pass in Sequence	20 N.m	15 lb ft
• M8 Bolts (1-5) - Second Pass in Sequence	30 N.m	22 lb ft
• M8 Bolts (6-10) - First Pass in Sequence	20 N.m	15 lb ft
• M8 Bolts (6-10) - Second Pass in Sequence	30 N.m	22 lb ft
• M10 Bolts - First Pass in Sequence	20 N.m	15 lb ft
• M10 Bolts - Final Pass in Sequence	80 degrees	
• M10 Studs - First Pass in Sequence	20 N.m	15 lb ft
• M10 Studs - Final Pass in Sequence	51 degrees	
Crankshaft Oil Deflector Nuts	25 N.m	18 lb ft
Crankshaft Position (CKP) Sensor Bolt	25 N.m	18 lb ft
Crankshaft Rear Oil Seal Housing Bolts	30 N.m	22 lb ft
Crossbar Bolts/Nuts - 1500 Series	100 N.m	74 lb ft
Crossbar Bolts/Nuts - 2500 Series	120 N.m	89 lb ft
Cylinder Head M8 Bolts - in Sequence	30 N.m	22 lb ft
Cylinder Head M11 Bolts - First Pass in Sequence	30 N.m	22 lb ft
Cylinder Head M11 Bolts - Second Pass in Sequence	90 degrees	
Cylinder Head M11 Bolts - Final Pass in Sequence	70 degrees	
Cylinder Head Plug	20 N.m	15 lb ft
Differential Carrier-to-Crossbar Nuts	100 N.m	74 lb ft
Engine Block Coolant Drain Hole Plug	60 N.m	44 lb ft
Engine Block Coolant Heater	50 N.m	37 lb ft
Engine Block Oil Gallery Plugs	60 N.m	44 lb ft
Engine Harness Ground Strap Bolt/Stud	16 N.m	12 lb ft
Engine Harness-to-Generator Bracket Bolt	9 N.m	80 lb in
Engine Harness Retainer-to-Intake Manifold Nut	5 N.m	44 lb in
Engine Mount Bracket Through Bolt	100 N.m	74 lb ft
Engine Mount-to-Engine Block Bolts	50 N.m	37 lb ft
Engine Mount-to-Frame Bolts	65 N.m	48 lb ft
Engine Shield-to-Crossbar Bolts	20 N.m	15 lb ft
Evaporative (EVAP) Emission Pipe Bracket Nut	20 N.m	15 lb ft
Exhaust Manifold Bolts - First Pass	15 N.m	11 lb ft
Exhaust Manifold Bolts - Final Pass	20 N.m	15 lb ft
Exhaust Manifold Heat Shield Bolts	9 N.m	80 lb in
Exhaust Manifold Studs	20 N.m	15 lb ft
Flex Plate-to-Torque Converter Bolts - 4L60-E/4L70-E/6L80 Transmission	63 N.m	47 lb ft
Flex Plate-to-Torque Converter Bolts - 4L80-E Transmission	60 N.m	44 lb ft
Front Cover Bolts	25 N.m	18 lb ft
Front Drive Axle Bracket Bolts	90 N.m	67 lb ft
Fuel Injection Fuel Rail Bolts	10 N.m	89 lb in
Fuel Injection Fuel Rail Crossover Tube Bolts	3.8 N.m	34 lb in
Fuel Rail Stop Bracket Bolt	50 N.m	37 lb ft
Generator Bracket Bolts	50 N.m	37 lb ft
Heater Hose Bracket Nut	9 N.m	80 lb in
Ignition Coil Bracket-to-Valve Rocker Arm Cover Studs	12 N.m	106 lb in
Ignition Coil-to-Bracket Bolts	10 N.m	89 lb in
Intake Manifold Bolts - First Pass in Sequence	5 N.m	44 lb in
Intake Manifold Bolts - Final Pass in Sequence	10 N.m	89 lb in
Intake Manifold Sight Shield Retainer Bolts	5 N.m	44 lb in

GM Specifications:

J 41798 M8 Bolt	25 N.m	18 lb ft
J 41798 M10 Bolts	50 N.m	37 lb ft
Knock Sensor Bolts	25 N.m	18 lb ft
Negative Battery Cable Stud	25 N.m	18 lb ft
Oil Filter	30 N.m	22 lb ft
Oil Filter Fitting	55 N.m	40 lb ft
Oil Level Indicator Tube Bolt	25 N.m	18 lb ft
Oil Pan Baffle Bolts	10 N.m	89 lb in
Oil Pan Closeout Cover Bolt - Left Side	9 N.m	80 lb in
Oil Pan Closeout Cover Bolt - Right Side	9 N.m	80 lb in
Oil Pan Cover Bolts	9 N.m	80 lb in
Oil Pan Drain Plug	25 N.m	18 lb ft
Oil Pan M6 Bolts - Oil Pan-to-Rear Housing	12 N.m	106 lb in
Oil Pan M8 Bolts - Oil Pan-to-Engine Block and Oil Pan-to-Front Cover	25 N.m	18 lb ft
Oil Pan Skid Plate Bolts	28 N.m	21 lb ft
Oil Pressure Sensor	35 N.m	26 lb ft
Oil Pump Cover Bolts	12 N.m	106 lb in
Oil Pump Relief Valve Plug	12 N.m	106 lb in
Oil Pump Screen Nuts	25 N.m	18 lb ft
Oil Pump Screen-to-Oil Pump Bolts	12 N.m	106 lb in
Oil Pump-to-Engine Block Bolts	25 N.m	18 lb ft
Power Steering Pump-to-Engine Block Bolts	50 N.m	37 lb ft
Spark Plugs	15 N.m	11 lb ft
Throttle Body Bolts	10 N.m	89 lb in
Throttle Body Nuts	10 N.m	89 lb in
Throttle Body Studs	6 N.m	53 lb in
Timing Chain Tensioner Bolts	25 N.m	18 lb ft
Transfer Case Vent Hose Bracket Nut	20 N.m	15 lb ft
Transmission Housing-to-Engine Bolts/Studs	50 N.m	37 lb ft
Transmission Oil Cooler Line Clip Bolt	9 N.m	80 lb in
Transmission Oil Level Indicator Tube Nut	18 N.m	13 lb ft
Valley Cover Bolts	25 N.m	18 lb ft
Valve Lifter Guide Bolts	12 N.m	106 lb in
Valve Lifter Oil Manifold Bolts	25 N.m	18 lb ft
Valve Rocker Arm Bolts	30 N.m	22 lb ft
Valve Rocker Arm Cover Bolts	12 N.m	106 lb in
Water Inlet Housing Bolts	15 N.m	11 lb ft
Water Pump Bolts - First Pass	15 N.m	11 lb ft
Water Pump Bolts - Final Pass	30 N.m	22 lb ft

Radiator hose guide:

MoTech Radiator Hose Application:						
Gen IV TRUCK engines						
MoTech Radiator	**Part #**	**Upper neck angle**	**Upper outlet**	**Lower outlet**	**Upper hose**	**Lower hose**
42 mm radiator single pass	3466	Straight	Driver	Passenger side straight	Gates 21191 or Dayco 71270	Goodyear 62024
52 mm radiator single pass	7036	Straight	Driver	Passenger side straight	Gates 21191 or Dayco 71270	Goodyear 62024
52 mm radiator dual pass	7036M	Straight	Passenger	Passenger side angle out	Gates 20137 or Dayco 71178	Goodyear 70081
52 mm radiator dual pass	7036U	Up 10 degrees	Passenger	Passenger side angle out	Gates 20137 or Dayco 71178	Goodyear 70081
Gen IV LS3 based engines						
42 mm radiator single pass	3466	Straight	Driver	Passenger side straight	Gates 21873 or Dayco 71626	Goodyear 62024
52 mm radiator single pass	7036	Straight	Driver	Passenger side straight	Gates 21873 or Dayco 71626	Goodyear 62024
52 mm radiator dual pass	7036M	Straight	Passenger	Passenger side angle out	Gates 21873 or Dayco 71626	Goodyear 70081
52 mm radiator dual pass	7036D	Down 10 degrees	Passenger	Passenger side angle out	Dayco 72468	Goodyear 70081

Part list:

Description	Manufacturer	Part number	Quantity
Accessory drive GM Gen IV truck:	**GM**	**19258433 includes:**	1
Drive Belt	GM	12626222	1
Idler Pulley w/Bolt 1	GM	1258077	1
Alternator	GM	20989651	1
Alternator bolt	GM	11516360	2
P/S Pump	GM	20756714	1
P/S Brace	GM	12554032	1
P/S Brace Nuts	GM	11514597	2
P/S Brace Bolt	GM	11515764	1
P/S Pump Pulley	GM	12604004	1
Stg Pump Mtg Bolt	GM	11515767	3
Bolt 3/8"-16	GM	19257882	1
Nut 3/8"-16	GM	19440957	1
Washer Power Steering Pump Pulley	GM	19258317	1
Install tool (included)	GM	NA	1
Note: you may also need the following items to use this drive kit:			
Bolt, Tensioner	GM	11518633	2
Tensioner	GM	12609719	1
Bracket, Steering/Generator	GM	12554030	1
Bolt, Bracket	GM	11516744	4
Balancer	GM	12634105	1
Bolt, Balancer	GM	12557840	1
Kit, Water Pump (includes gaskets)	GM	12600767	1
Bolt, Water Pump	GM	12551926	6
AC compressor Sanden GM drive	Sanden	4514 508 style	1
Air filter disposable (seal O-ring with silicone)	Spectre	8136	1
B&M Transmission cooler: 11" x 5-3/4" x 1-1/2" includes 14,400 BTU 11" x 5-3/4" x 1-1/2" 3/8" Barb Inlet/Outlet Black Finish **Includes Cooler, Hose, Fittings, Brackets, Hose Clamps, Mounting Hardware, Installation Kit**	B&M	70264	1
B&M SuperCooler Universal Cooler 20,500 BTU 11" x 8" x 1-1/2" 1/2" NPT Inlet/Outlet Black Finish Includes Cooler Only **Requires transmission cooler hose, fittings and clamps. For heavy duty applications and towing.**	B&M	70266	1

Body control module (included in kit)	GM	25835966	1
Brake booster Nipple LS	GM	12559760	1
Exhaust manifold Trailblazer Left	GM	12600526	1
Engine control module (included in kit)	GM GM GM	2007 - 2008 -12612384 2009 - 12625455 2010 - 2015 -12633238	1 1 1
Exhaust manifold Trailblazer Right	GM	12600527	
Exhaust manifold Trailblazer Left Shield	GM	12500526	1
Exhaust manifold Trailblazer Right Shield	GM	12500527	1
Exhaust flange Trailblazer driver side			1
Exhaust flange Trailblazer passenger side			1
Exhaust flange seal Trailblazer driver side	GM	15077362	1
Exhaust flange seal Trailblazer passenger side	GM	15035747	1
Flexplate - automatic	GM	12563136	1
EVAP purge valve	GM	12597567	1
EVAP vent solenoid (included in kit)	GM	20981705	1
Flywheel bolts	GM	11569956	6
Fuel tank pressure sensor (included in kit)	GM	13502903	1
Harmonic balancer bolt	GM	12557840	1
Harmonic balancer – Truck, Camaro	GM	12634105	1
Harmonic balancer – Corvette offset	GM	12635649	1
Heater hose	Gates	28473	2
Motor mount hydraulic	GM	15854941	2
O2 sensor downstream	GM	12609457	2
O2 sensor upstream	GM	12583804	2
Oil cap – truck	GM	12551595	1
Oil level dipstick – truck	GM	12622055	1
Oil level tube – truck	GM	12604222	1
Paint			
Plastic inspection cover Left	GM	24261713	1
Plastic inspection cover Right	GM	24261712	1
Radiator cap large	Stant	10234	1
Radiator cap small	Stant		1
Serpentine belt JK drive			1
Starter motor bolts	GM	11610787	2
Starter motor SS Camaro	GM	12617229	1
Transmission cooler lines	GM	92236244	1
Transmission dipstick	GM	15877378	1
Transmission dipstick tube	GM	25879175	1
Transmission dipstick tube seal	GM	15796802	1

Transmission mount 4x4	GM	15840278	1
Water pump Camaro SS for LS3 engines MoTech JK drive	GM AC Delco	19207665 or 252975 (no hardware)	1 1
Water pump Corvette – CTV drive	GM	19180610	1
Water pump Truck	GM AC Delco	12600767 or 252901 (no hardware)	1 1
