



Remove this 13 mm bolt holding a ground strap onto the rear of the engine.

— Separating the engine and transmission —



With all the engine-to-transmission bolts now removed, the process of separating the transmission case from the engine block is next.



Start by wedging a “pry bar” into the space between the engine case and the transmission mounting flange on the exhaust side of the engine. Lightly pry it apart a few millimeters—if this takes more than a few tugs to release the two, recheck your work. You probably missed a fastener, as this shouldn’t take an enormous amount of force. Stop and move to the other side of the engine to slowly work the transmission off evenly.



On the front of the engine, repeat the wedging of the pry bar and light tugging to separate the engine and transmission.



With the engine and transmission separation started, you can move to the end of the transmission and work it off the engine. Expect the engine and transmission to rock in opposite directions as they come apart, as they don’t have “flat” bottoms—so watch the placement of your fingers!

— Tape the engine-to-transmission shim to block —



Well, you’ve done it! The engine and transmission are now separated. Make sure to catalog all the fasteners in marked Ziplock bags for reassembly.



As one final note, make sure this thin shim stays with the block as it needs to be installed between the engine and transmission. Many engine builders just tape the shim to the block and leave the tape on there when the engine and trans are reassembled (it doesn’t affect the mounting). Congrats! Now you can tear this baby down and install some performance-oriented components (for some ideas on this, check out Chapter 6).



Reinstalling the ECOTEC 2.0L Supercharged LSJ Engine

Reinstalling the Ecotec 2.0L Inline 4-cylinder supercharged LSJ engine into a Cobalt SS Supercharged is no problem with this chapter at your side. With over 169 photos 'showing' you the action, making your Cobalt SS Supercharged lightning fast is completely doable.

In the continuing effort to show the details needed to work on the impressive Ecotec 2.0L Supercharged LSJ four-cylinder engine, here's where you learn how to bolt the LSJ engine back into the Chevy Cobalt SS and Saturn Ion Red Line after doing some serious power upgrades (like new forged pistons, higher springrate valvesprings, a ported cylinder head or the like).

As always, it is recommended you read this chapter completely before beginning the activity of installing the engine so you are aware of any special tools or actions that need to be taken along the way and you can prepare appropriately.

Tools to Do the Job

Check out the photo and list of tools needed to perform this installation on Page 18 (Chapter 2). As in the previous chapter, in which the engine and transmission were removed from a Cobalt SS, you'll need access to the four-point vehicle lift and a furniture cart to position the vehicle over the engine/transmission cradle assembly and roll the cradle assembly around, respectively.



In the last chapter, we showed you how to get the engine out of the 2005-2007 Chevrolet Cobalt SS Supercharged vehicle and separate the engine and transmission. A 2004-2007 Saturn Ion Red Line would be similar. This chapter will show you the details necessary to reinstall these assemblies into the vehicle.



To start, the engine and transmission need to be bolted together. This begins with the positioning of the factory engine-to-trans shim on the pins of the engine bellhousing.



Use a few pieces of masking tape to hold the shim in place on the engine block.



When mating the transmission up to the engine, you'll want to ask for some help, as the bottom of both the engine and trans are not even close to where the engine and trans need to be positioned to get them to mate to each other. To start, have your helper hold the passenger-side jack shaft and mount in position as the trans is slid into the proximity of the engine.



After getting the transmission case muscled up close to the engine bellhousing, start to line up the two locating pins and holes in the transmission case. These will help to guide everything together.



The first time you go through this endeavor, it will probably help to have your helper "hold" the transmission and jackshaft assembly in place while you look at how everything needs to be maneuvered to mate up. These pieces don't go together easily, so be patient here!



A great trick to make this job easier is to have a bunch of different thickness wood pieces available, like this 1x3 wood block, to shim the engine and transmission in the front, back and sides to hold the pieces level as everything gets closer together.



The bolt hole diameters through the transmission are tight to the bolts, so you'll need to have one person holding the transmission case tightly to the flange of the bellhousing, while the other person feeds the bolts through the transmission to get them started on the threads.



With at least one bolt hand started to hold the engine and transmission together, hand thread the remaining 18 mm transmission bolts in place



Using a deepwell 18 mm socket, tighten all eight transmission bolts to just past hand tight, then using a torque wrench (as shown here), tighten the bolts to 55 ft-lb (75 N-m) working on them in a radial pattern.

Positioning wiring on engine/transmission



A major trunk of the wiring harness needs to be routed behind this machined fitting (arrow) because it is just long enough to reach the various connectors it attaches to if routed through the area (we learned this the hard way!). Start by fishing the harness section through with this engine-to-body harness connector.



Fish the speed sensor connector and reverse lights connector wiring looms through this same area (it's tight, so be patient!) behind the machined fitting. (Note for 2004 MY Saturn Ion RL owners: the speed sensor tone wheel is mounted on the axle shaft. The sensor is mounted on brackets at this location).



Pull the remaining portion of the wiring harness section through until it is lying on the transmission like this.

Installing jackshaft assembly



Hand start the 15 mm bolts for the jackshaft engine block mounts. Then, using a deepwell 15 mm socket, tighten these bolts to just beyond hand tight.



Torque the jackshaft engine block mount bolts to 37 ft-lb (50 N-m) in a radial pattern.

Installing the starter



Install the starter and hand start the two 15 mm bolts. Tighten them to past hand tight and torque to 30 ft-lb (40 N-m).



Install the small connector ignition switch wire onto the small stud and tighten the 8 mm nut to 1/8-turn past hand tight.



Install the big connector main power wire onto the large stud and tighten the 13 mm nut to 1/4-turn past hand tight.



Install this main ground cable onto the stud/bolt of the transmission (there are two of these—one here and the other just above it) and tighten the 13 mm nut over it.

Installing ground wire (continued)



This is what the stud/bolt will look like with the ground wire on it and the holddown nut.

Installing engine/transmission on cradle & cart



Lift the engine/trans combination up with a chain attached to the two factory engine lift brackets and slide a cart with the engine cradle on it under the engine/trans. As we said in the previous chapter, this cart is custom built for these installs, but a moving cart with some blocks of wood nailed to it to stabilize the cradle will work.



With the engine/trans and cradle positioned as shown here, lower the engine/trans down onto the cradle until the engine mounts slide into the brackets on the cradle.



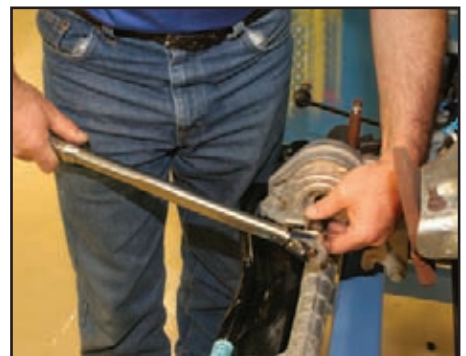
Install the 18 mm front engine mount bushing bolt and hand start the threads.



Tighten the bolt to 1/4-turn past hand tight before torquing to 74 ft-lbs (100 N-m).



Slide this heat shield on the rear engine mount bushing before installing the 18 mm bolt.



Hand start the threads on this rear engine mount bushing bolt and torque it to 74 ft-lbs (100 N-m).

—Completing engine cradle assembly—



With the engine mount bolts installed, you can release the tension on the engine lift chain and remove the two hooks in the factory lift brackets.



Roll the engine/trans/cradle cart under the engine bay of the vehicle up on the four-point lift. You will now be installing the radiator/A/C condenser/inlet intercooler system on the engine cradle.



Start by positioning the radiator/condenser/intercooler/fan assembly up on the engine cradle mount at the front of the engine cradle. There are two rubber bushings on the assembly that seat in two holes on the cradle (arrow on one)—so make sure these are in place before proceeding.



Route the long upper radiator hose around the side of the engine (over the transmission) to the fitting on the coolant distribution block near the cylinder head.



Using a pair of pliers (you see the business end of the remote pliers from Snap On, but in this case, you could use standard pliers), compress the hose clamp to slide the hose on the fitting. Release the clamp tangs to lock the hose in place on the fitting.



Plug in the electrical connector for the fan power by pushing it on the fitting on the fan assembly.



Install the lower hose for the inlet intercooler system by pushing the hose on the fitting, compressing the clamp and positioning it in place before releasing clamp.



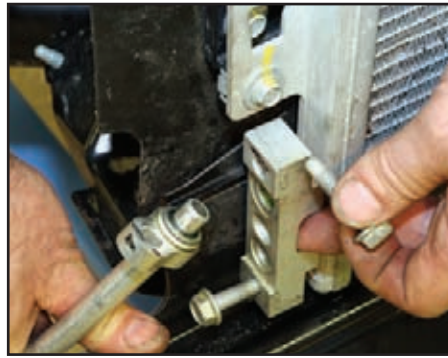
Install the upper intercooler hose on the plastic fill assembly by compressing the clamp with pliers, sliding the hose on the fitting and releasing the clamp.



Install the passenger side radiator hose on the radiator fitting by compressing the clamp, sliding the hose in place and releasing the clamp to lock it on the fitting.



This is what the hose and clamp will look like when they are locked in place on the radiator.



Install the top one of the two A/C fittings that go on the side of the A/C condenser. Apply a light coat of Vaseline to the O-ring on the fitting and push it into the condenser. The other fitting is plumbed into the vehicle, so it will be installed after the engine is reinstalled in the vehicle.



Tighten the 13 mm hold-down bolt for the A/C fitting to 12 ft-lbs (16 N-m).

— Lowering vehicle over engine cradle assembly



With the cooling system installed, the engine/transmission combination on the cradle is now ready to have the vehicle lowered down onto it.



Slowly start to lower the vehicle down onto the engine/trans cradle. We say slowly because you're going to spend A LOT of time getting the engine/trans cradle situated properly under the vehicle BEFORE the vehicle is completely lowered down onto the engine/transmission.



The first step is to get the engine located properly forward and aft so the radiator doesn't hang up on the front sheetmetal of the vehicle.



With the vehicle lowered past the radiator, you'll need to reach down into the engine bay to pull the wiring up out of the way of the engine mounts and engine bay sheetmetal.



Check under the vehicle often to make sure all the wires, hoses and other equipment are not being damaged by crushing, scraping or other interference with the body as you bump the vehicle down very slowly.



Basically, you need to be looking in the engine bay and from under the vehicle at every angle and corner to make sure the entire package is going in the vehicle without causing any damage, and lining up properly with the mounting holes for the engine cradle bolts.

This is what the engine/transmission combination should look like when the body is fully lowered down on the cradle.

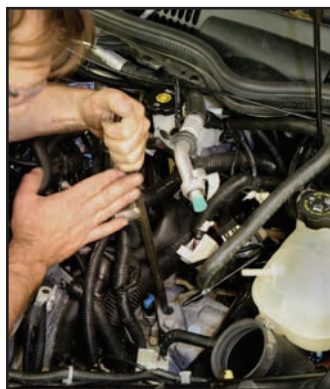
—Aligning cradle mount holes with body mounts



The engine cradle will most likely need to be “coerced” slightly with an awl slid through the cradle bolt and body holes. To do this, once the awl is fully seated in the holes, pry the cradle in the direction required to line the holes up.



The cradle body hole is very close in diameter to the bolt, so the cradle and body need to be very close in alignment for the bolt to go up into the threaded body hole. Hand start the threads on the four 21 mm cradle/body mount bolts.



Use the awl to persuade the upper engine mounts to line up with the threaded holes in the body. Hand start the threads on the 16 mm mount bolts.



—Installing cradle/body mount bolts



If you can, use an air impact gun to tighten the cradle bolt holes to a very tight setting so you can lift the vehicle up before doing the torque wrench check on the bolts.



With the engine cradle and upper engine mount bolts torqued to 74 ft-lb (100 N-m), the body can be lifted off the now-empty cart.



Pull the cart out from under the vehicle—you’re done with this!



Using a large torque wrench, check that the torque on the lower cradle mounting bolts is at 74 ft-lb (100 N-m).

— Installing upper engine mount bolts —



Use a hydraulic floor jack with a piece of wood on the lift point to jack up the passenger's side of the engine to get the upper engine mount on the passenger's side to line up with the engine mount. The photo at right shows where to lift on the engine oil pan.



Hand start the three 16 mm upper engine mount bolts into their threads.



Torque the upper transmission mount bolts on the driver's side to 74 ft-lb (100 N-m).



Torque the upper engine mount bolts on the passenger's side to 74 ft-lb (100 N-m).

— Install Exhaust —



Slide the "downpipe" into position in the vehicle and hand start a few of the fasteners to the rear portion of the exhaust.



Use one of the three exhaust-header-to-downpipe bolt/studs to position the gasket in place. Then, rotate the gasket into position between the header and downpipe and install the second bolt/stud.



This is what the exhaust downpipe should look like when it is properly installed.

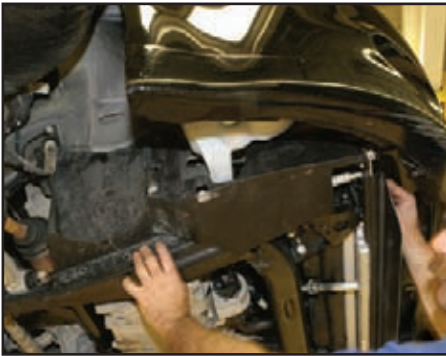


Torque the three bolt/studs at the header/downpipe flange to 22 ft-lb (30 N-m).



Reinstall the electrical connector for the O₂ sensor until the lock tang "clicks" in place.

— Installing passenger closeout panel and wiring



Reinstall the black plastic "splash panel" on the passenger's side of the front fascia by positioning it in place and installing the many pushpins and two 7 mm bolt screws.



Reinstall the Mass Air Flow electrical connector on the sensor under the driver's side headlight area.



Reinstall the closeout panel that is positioned above the air cleaner box.



Feed the ground cable through this opening and onto this bolt/stud. Tighten the 13 mm nut onto the stud and torque to 18 ft-lb (25 N-m).



Hand start the threads on one of the three 10 mm headlight closeout bolts. You'll probably need to wiggle the closeout panel a little to get the holes to line up.



Hand start the threads on the second 10 mm mounting bolt while positioning the closeout bracket to line up the holes.



Tighten all the closeout bracket bolts to 89 in-lb (10 N-m).



Torque the small 10 mm bolts on the radiator core support to 89 in-lb (10 N-m).

— Installing headlight bezel —



With the headlight bezel in your hand, plug in the electrical connector (make sure the lock tang 'clicks' into place).



Feed the headlight wiring back into the closeout bracket as the headlight is brought closer to the headlight mount.



Slide the headlight into the opening of the front fascia.



Hand start the threads on the two 10 mm headlight bolts and then tighten them to 89 in-lb (10 N-m).



Install the front radiator closeout panel and start to slide the pushpins into the radiator core support. Push down on each pushpin to lock them in place.



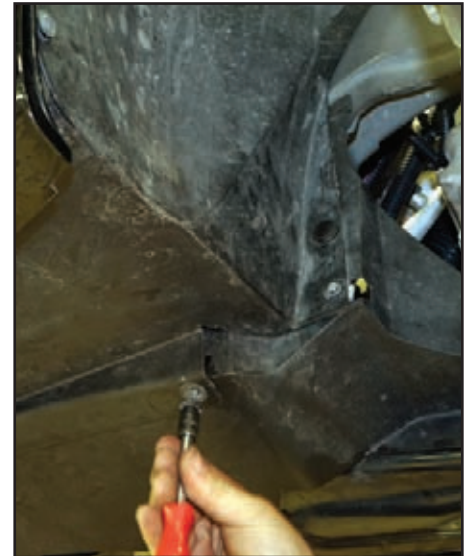
— Installing driver's side splash panel —



Position the driver's side splash panel up in the front of the engine cradle. Locate the holes in the panel with the many pushpin and screw holes in the vehicle.



It helps if you have a pushpin with you so you can push one in place to hold the panel while you install the remaining five pushpins and four 7 mm bolt screws in both panels.



— Installing front drivetrain and suspension components —

The process of reinstalling the drivetrain and suspension components is shown on the passenger's side, but the process is exactly the same on the driver's side of the vehicle—so just repeat it there to fully install the drivetrain and suspension components.



To begin the reassembly of the front suspension/drivetrain, start by pulling the wheel hub out slightly to position the axle splines behind the hub. Align the splines of drive axle with those in the drive hub ...



... And push the hub inward until the drive axle pokes out the front of the drive hub.



These are the hub washer and 30 mm lock nut that need to be hand started on the axle threads.



Now, install the ball joint into the spindle upright. To do this, the ball joint shaft will need to be maneuvered to align with the hole in the spindle upright.



Push the lower A-arm up to seat the ball joint shaft in the spindle upright. Slide the 15 mm lock bolt through the upright from the rear to the front to hold the ball joint in place and hand start the 16 mm nut on the bolt.



Lift up on the swaybar link in preparation for reinstalling on the strut mount.



Hand start the 18 mm swaybar mount nut on the threads of the swaybar throughbolt.



Wipe off the shaft of the steering tie rod and push it firmly into the tapered hole in the spindle upright.



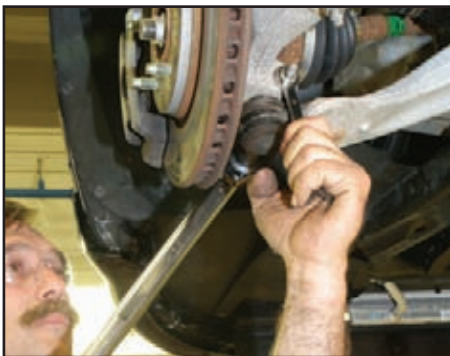
Hand start the threads of the 18 mm lock nut.



Torque the tie rod end nut to 18 ft-lb (40 N-m) and then rotate the nut another 90 degrees.



Torque the swaybar rod end nut end to 48 ft-lb (65 N-m).



Torque the ball joint bolt and nut combo to 41 ft-lb (55 N-m).



With a helper holding the brake pedal down firmly, torque the drive axle nuts to 37 ft-lb (50 N-m), back them off 3/4-turn, then retorque to 37 ft-lb (50 N-m) and rotate another 30 degrees.

Installing steering U-joint shaft



Lightly polish the end of the shaft that comes out of the rack and pinion unit with a scotchbrite or steel wool pad to knock off any rust or dirt particles in preparation for sliding the steering U-joint on the shaft. This shaft has been prepped already.



Slide the U-joint on the rack and pinion shaft. There are two "flats" in the shaft so the U-joint can go on either correctly or 180 degrees out of phase. This is why you should have the steering wheel locked in the "wheels straight" position, so you just need to have the wheels pointed straight and everything will go together correctly.



Tighten the lock nut to just past hand tight with a 13 mm deepwell socket on a 12-inch extension and ratchet wrench.



Torque the U-joint lock nut to 25 ft-lb (34 N-m).

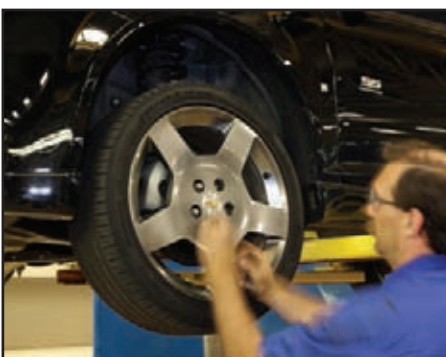
Installing vehicle mounted A/C line



Up under the front fascia on the passenger's side, install the bottom of the two A/C fittings that go on the side of the A/C condenser. Apply a light coat of Vaseline to the O-ring on the fitting and push it into the condenser.



Tighten the 13 mm holddown bolt for the A/C fitting to 15 in-lbs (20 N-m).



Install the front wheels/tires and hand start the five 18 mm lugnuts on the studs. Tighten these lugnuts to just past handtight and place a note on the wheel that the lugs need to be torqued to 100 ft-lb (140 N-m) when the vehicle is returned to the ground!

Installing shifter cables



Under the hood, gently pull up on each leg of the mass of wiring and place it off to the side of the engine bay so you can access the shifter cables—which will be installed next.



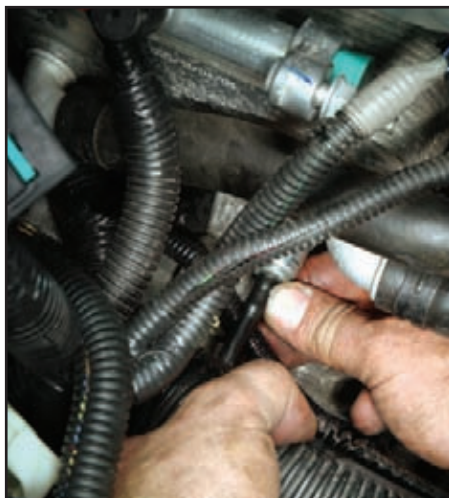
Reach down into the engine bay to push the two transmission cable anchor points into the transmission mounted anchor brackets (there is an upper and lower cable—the cream-colored sleeve should be installed in the lower slot, and the black sleeve in the upper slot of the bracket. Be sure these cables aren't "twisted over each other" as they route through the engine bay—as this will cause the shifter to bind during use.

Installing clutch slave line

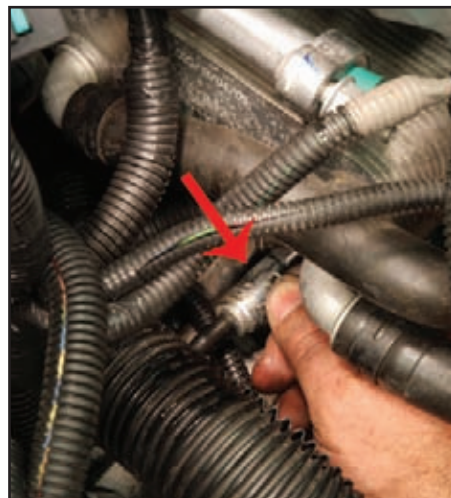


Push the ends of the two cables onto each of the two gold transmission armatures until they "click" into place.

Note: Make sure the shifter arms are in the position they were in when the engine was removed.



Install the dry break fitting for the clutch slave system by pushing it firmly into the machined distribution block mounted on the top of the transmission.



Push the "C" clip into the machined clutch slave system distribution block to lock the dry break in place on it.



Remove the large rubber plugs used to seal off the separated A/C line running along the driver's side of the engine.



Wipe a light coat of Vaseline on the A/C line rubber O-ring and push the two fittings together. Hand start the threads on the 13 mm bolt that holds these two fittings together.



Tighten this 13 mm bolt to 15 ft-lbs (20 N-m).



Push the black plastic pushpin on the A/C line down into this bracket on the engine to hold the hose in place.

Reattaching various electrical and hose connections



Attach this engine mounted body-to-engine electrical connector to the end mounted to the cowl of the Cobalt SS. Push the two connectors together until the lock tang "clicks."



Push the heater hose on the engine mounted fitting located between the cylinder head and cowl of the Cobalt SS.



Reach between the engine and firewall to install the heater hose.



Pull the rubber plug you had in the fuel line in preparation for reinstalling it on the engine fuel line. Be careful to not damage the inner tangs on the dry break fitting when pulling the plug.



Firmly push the two ends of the fuel line together until you hear a very light "click" of the tangs locking in place.



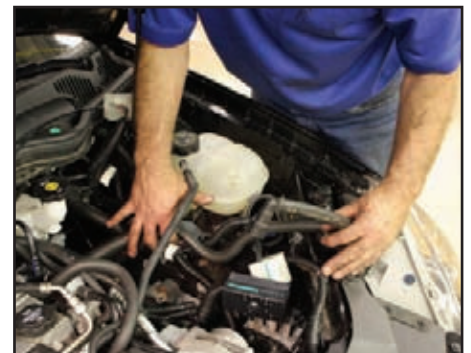
To check the "lock" of the fittings, lightly pull the two fuel lines apart—if they stay together, you are locked in place. If they separate unevenly, you need to push them together more firmly.



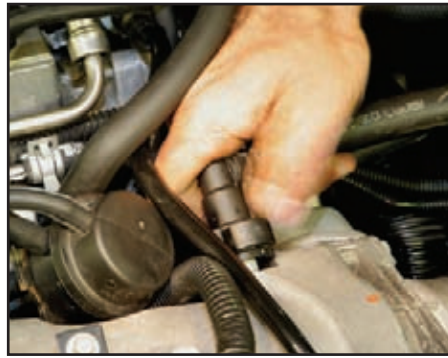
Place the fuel line in the plastic clip on the cylinder head and close the clip over the hose to lock it in place.



Push this canister purge line onto the metal nipple (arrow) until the lock "clicks."



Install and route the boost control hose between the inlet portion of the supercharger and the control solenoid located on the driver's side of the cylinder head.



Push one end of the brake booster hose end onto this metal nipple (photo at left, arrow) located on the supercharger. Once the hose end is on the nipple (middle photo), push the lock tab down to affix the hose onto the nipple (arrow on photo on right). To test the lock, lightly pull back on the hose—it should stay in place.

— Installing coolant overflow tank hose —



Pull the engine coolant system overflow tank up to the nipple on the overflow tank.



Compress the clamp on the overflow tank hose to allow the hose to be pushed onto the nipple on the overflow tank. Release the clamp to lock the hose in place.

— Installing fuse box —

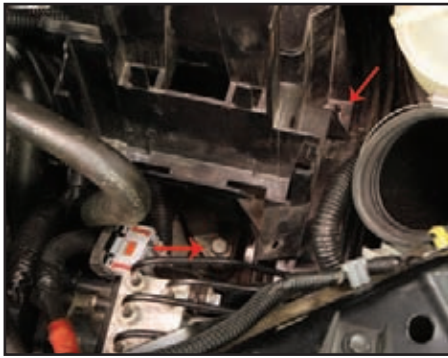
Getting the wiring properly located under, around and into the fuse block is a little confusing, so don't be surprised if you have to make a few backtracks on this portion of the reinstallation.



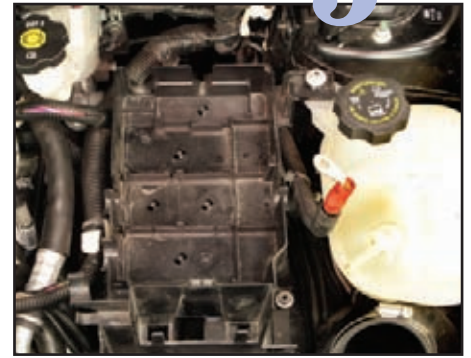
Push the many wiring connectors out of the area where the engine bay mounted fuse box baseplate is installed on the driver's side area of the engine bay. Then, lower the baseplate down into the area. Focus on locating the baseplate so the slotted opening goes over the bolt in the framerail and that the studs seat in the many holes located on the baseplate.



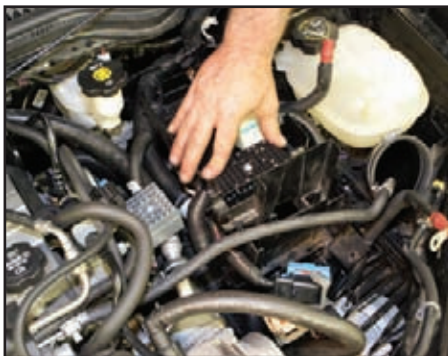
Feed the red power cable up around the driver's side of the fuse box baseplate in preparation for installing the cable on the front corner of the fuse box.



Fasten the baseplate with the two 13 mm bolts and one 10 mm nuts. Torque these to 89 in-lbs (10 N-m).



This is the baseplate fully installed in the vehicle. There will be five wiring connectors nested into this baseplate for the Cobalt SS, and three on the Ion, that are sandwiched by the midplate to create the fuse box.



Position each wiring connector over the baseplate and seat it in the proper opening. Each connector will only fit in one opening on the baseplate—so don't force them! This might take some reworking of the wiring to get everything to fit properly.



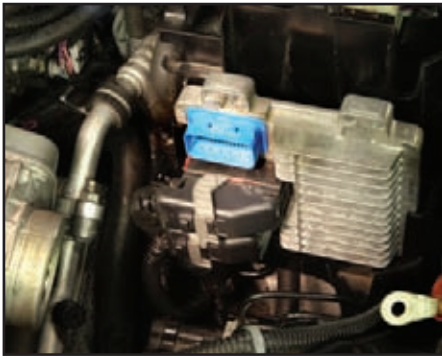
Continue positioning wiring connectors on the baseplate until it is filled with connectors seated in their respective areas.



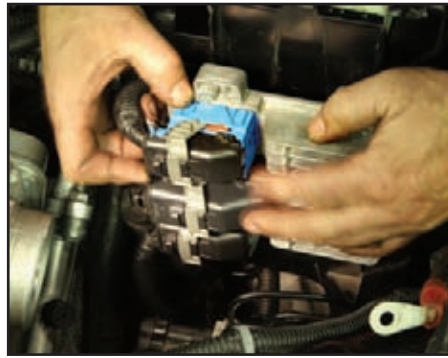
Lower the Powertrain Control Module (PCM) into the engine bay and seat it in the holder in the front of the fuse box baseplate.



Begin installing the underhood wiring connectors by pushing the gray connector into the lower receptacle of the PCM and pulling the lock tang over to fasten the connector in place. NOTE: Fully seat the PCM connector before pulling the lock lever. Using the lever to seat the connector can cause the pins to expand, causing electrical issues down the line.



Install the “black” connector next in the middle receptacle by pushing the connector on and pivoting the lock tang over.



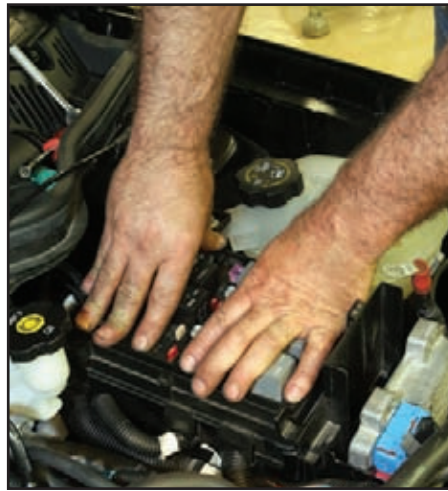
Install the “blue” connector in the top receptacle of the PCM and lock in place.



This is what the engine bay should look like at this point in the installation—so take a minute and look over your engine bay vs. this photo.



This photo shows you the bottom of the fuse box “midplate” that needs to be carefully installed over the various connectors. You’ll need to finesse the connectors around to get them to “seat” in the connections that are molded into the bottom of this plate (shown in the photo).



With all the connectors situated properly in the midplate, push down firmly to seat the connectors in the midplate.



Hand start the two 10 mm bolts used to fasten the midplate on the baseplate of the fuse box.



Position the two positive battery cables on the front corner of the fuse box and hand start the threads of the tall nut on the fuse box stud.



Hand tighten the tall nut and torque the nut to 89 in-lb (10 N-m).



Install the “white” connector for the electronic power steering in the rear corner of the midplate of the fuse box. Push down on it until the lock tab “clicks”. As a rule, if the “Service Power Steering” code lights up during startup, check this connection.

— Installing overflow tank hose —



Install the cover for the fuse box by pushing down until the lock tangs “click”.

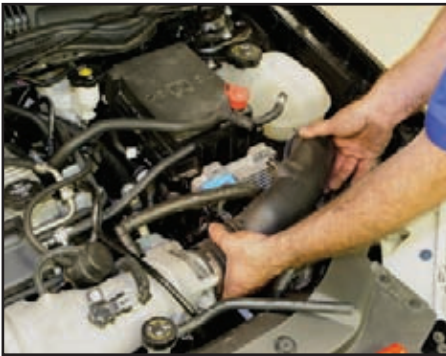


Position the radiator coolant overflow tank vent tube across the fuse box cover and seat it in the two plastic tangs in the cover.



Use pliers to compress the clamp tangs, slide the hose on the nipple of the overflow tank and release the clamp to hold the hose on the tank.

— Installing inlet tube —



Install the inlet tube between the airbox and throttle body (mounted on the supercharger) by lowering the air cleaner end down into the engine bay and mating up the other end with the throttle body.



Slide the inlet tube inside the rubber hoses at each end of the tube.



Tighten the adjustment bolts on the hose clamps at each end of the inlet tube to 1/8-turn past hand tight. Do not overtighten this hose, as it will collapse the induction tube.



— Installing EGR tube —



Install the EGR feed tube on to the nipple on the inlet tube.

— Checking engine fluids —



Check the dipstick and top off the oil in the engine w/ Mobil 1 synthetic oil (a factory-fill oil).



Add coolant to the fill tank. Be prepared: once the engine starts, you'll need to add coolant a few times until the system "burps" out all of the air and the coolant system is filled completely with a 50/50 mix of DexCool/water.

Note: The transmission fluid on the supercharged LSJ is special to this application. It is called Burmah Fluid, GM P/N 9986177 (or Castrol MTF 0063). To fill trans, pour fluid into trans until fluid weeps from the allen-head drain on top of the differential.

— Installing battery cable —



In the trunk, install the battery cable, start the vehicle and start checking for leaks, loose hoses and any other "issues". Top off the coolant mix before closing the hood and enjoying a drive in your newly reassembled Cobalt SS Supercharged.

— Engine completely installed —



This is what the Ecotec 2.0 L LSJ engine and 5-speed transmission will look like when completely reinstalled in the Chevy Cobalt SS.

Installing the GM Performance Stage 1 and Stage 2 Supercharged ECOTEC (RPO: LSJ) Engine Power Upgrade Kits

Learn how easy it is to install the GM Performance Stage 1 and Stage 2 performance upgrade kits on the supercharged Ecotec 2.0L engine that powers the Chevrolet Cobalt SS Supercharged and Saturn Ion Red Line vehicles.

Life is about to get much, much better for those driving the Saturn Ion Red Line (2004–2007) or Chevy Cobalt SS Supercharged (2005–2007) pocket rockets. That's because GM Performance has introduced two performance upgrade kits, called Stage 1 and Stage 2, that produce real power increases, are affordable and can be installed by the average enthusiast. This chapter will show you the details of installing the impressive Stage 1 and Stage 2 systems on the engine that powers these vehicles, the Ecotec 2.0L supercharged (regular production option = LSJ) engine.

By GM For You

The Stage 1 and Stage 2 performance upgrade kits were developed through the cooperation of engineers in GM Powertrain, GM Performance Division and GM Performance Parts. These kits are incredibly easy to install and make a dramatic difference in power output because the people that originally developed the Ecotec 2.0L LSJ engine created the Stage kits. In other words, the people that created this powertrain went back and got the most performance from it. Even better, the team was able to achieve this power increase while maintaining full 50-state emissions status, having met the

requirements for California Air Resources Board (CARB) Executive Order (E.O.) certification.

Easy Installation

Check out the following photo sequence for the step-by-step details to installing both the Stage 1 and Stage 2 performance

upgrade kits on a 2005–2007 Chevy Cobalt SS Supercharged and 2004–2007 Saturn Ion Red Line. If you have one of these Ecotec-powered 2.0L LSJ vehicles, you'll want this added performance—especially when you consider the ease of installation, the price and the fact that it was engineered by GM Performance.

Power Output

While the LSJ Ecotec engine is rated at 205 hp at 5600 rpm and 200 lb-ft of torque at 4400 rpm, the Stage kits bump the power considerably. The Stage 1 kit raises the horsepower and torque output to 236 hp @ 6600 rpm & 205 lb-ft @ 5600 rpm. Even better, the Stage 2 kit puts out 241 hp @ 6400 rpm & 218 lb-ft @ 5400 rpm. The big

improvement on the Stage 2 kit is the power increase in the middle of the powerband—it's impressive and what you'll probably enjoy the most (see the included dynamometer charts for more on this aspect of the upgrades). The power throughout the powerband is what you feel in the seat of your pants—and the Stage 2 package has plenty!

Part Numbers for Power

The Stage 1 and 2 systems are upgradeable, meaning you can install a Stage 1 kit first and eventually step up to the Stage 2 configuration via the Stage 2 upgrade kit. Use these part numbers to order your Stage 1, Stage 2 or the Stage 1 to 2 Upgrade Kit from your local GM Performance Parts Authorized

Center today (go to gmperformanceparts.com for a dealer locator).

Part Numbers To Know

17801947 - Stage 1
17803229 - Stage 2
17803230 - Stage 2 upgrade from Stage 1



Stage 1



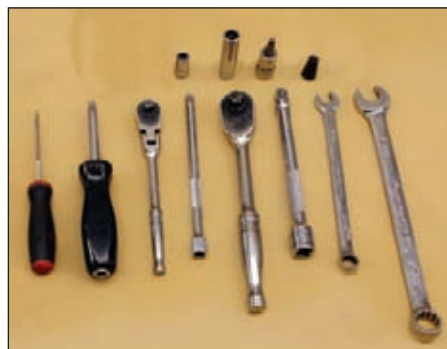
Stage 2

The Stage 1 performance upgrade kit for the Ecotec 2.0L supercharged engine consists of four high flow fuel injectors and a dealer installed "calibration." The Stage 2 performance upgrade kit consists of the four high flow fuel injectors, a custom performance pulley and hub system for the supercharger, a special belt (not shown) and a dealer installed "calibration."

Stage 1 Kit Installation

The first step to installing the Stage 1 kit is to bleed the fuel system pressure down—this can be performed by running the vehicle without the fuel pump operating. Then, the fuel injectors are removed, swapped for the Stage 1 fuel injectors and then the entire system is reinstalled on the 2.0 L LSJ Ecotec engine. The final step is getting the Stage 1 calibration flashed into the vehicle at your nearest GM dealer. Then, you can be down the road enjoying the newfound power of the Stage 1 system.

Tools Required



The tools required to install the Stage 1 and Stage 2 performance upgrade kits include: a small flat screwdriver, 1/2-inch and 3/8-inch ratchets and extensions, various sockets

(10 mm, 6 mm hex, 14 mm socket, T30 Torx) and some open-end wrenches (8 mm, 10 mm, 21 mm and 24 mm). You'll need "ft-lb" and "in-lb" torque wrenches to install the fasteners on the Stage 2 kit as there are fasteners that need to be torqued to 89 in-lbs (10 N-m) and some that require 18 ft-lbs (25 N-m).

Removing Ion Red Line fuel pump relay



The first step in removing the fuel injectors is bleeding off the fuel pressure in the fuel rail. This is accomplished by removing the relay controlling the fuel pump from the fuse block. On the Saturn Ion Red Line, the fuse block is located under the center stack of the dashboard.



Start accessing the Ion Red Line panel by removing a standard screw from the driver side of the center stack.



Pull the Red Line panel toward the rear of the vehicle to remove it from the center stack.



The Red Line fuel pump relay has a yellow stripe on it and is located in the upper left corner of the fuse block (finger pointing to it on left). Reach in and pull the relay out at this time (right).



Removing Cobalt SS Supercharged fuel pump relay



On the Cobalt SS, the fuse block is on the driver's side of the engine compartment. To access it, pull the cover off the top of the fuse block by grabbing the two sides of the cover and slightly peeling the tangs outward while lifting the cover off.

The fuel pump relay on the Cobalt SS is located towards the rear of the fuse block (fingers on it in photo on right). Pull it out at this time.



With the fuel pump relay removed, start the engine and let it run until it starts to stumble, then shut the engine off. Reinstall the fuel relay in the fuse block. You will not need to access it in the future so reinstall the closeout panels on the fuse block and interior (on the Red Line) pieces.



Move to the trunk to disconnect the negative battery cable from the battery. Start by lifting the carpet liner off the battery.



Loosen the 10 mm (5/16" on lon) nut on the battery cable and wiggle the cable off the battery stud. Wrap the cable end with a rag and place it on the floor.

Removing stock components



Move under the hood of the vehicle to start removing components to allow for the installation of the GM Performance Stage 1 performance upgrade kit. The first step is to unbolt the engine cover that is held in place with two T30 Torx screws.

Helpful Tip: It is suggested you place all component sets in Ziplock bags and mark each bag with a Sharpie pen to ease the reassembly process.



Loosen the 24 mm fuel line nut by pulling against a 21 mm open end wrench situated on the fuel rail anchor nut. This is to avoid twisting and possibly damaging the fuel rail as you apply torque to loosen the fuel line nut. Read the next caption before loosening the nut ...



Place a rag around the fuel line fitting to absorb any excess fuel coming out of the rail. Running the engine with the fuel pump relay out of the fuse block should have bled off most of the fuel pressure, and the rag will absorb any remaining fuel.



Remove the 10 mm bolt holding the fuel line onto the engine and pivot the fuel line off the front of the engine and lay it on the driver's side of the engine bay. This is required to access the fuel rail and fuel injectors, and remove them.

Helpful Tip: It is a good idea to blow off and/or vacuum the top of the engine at this point to remove any debris that could fall into any of the engine orifices that will be exposed when the injectors are removed.



CAUTION: ONLY PERFORM THE NEXT THREE STEPS ON A 'COLD' ENGINE.

Loosen the pressure cap on the coolant system reservoir (located on the driver's side of the engine bay) to make sure the system is not under pressure.



Unplug the coolant temperature sender electrical connector from the front of the engine by pushing on the black plastic tang with your thumb while carefully pulling up on the connector.



Remove coolant steam pipe on front-passenger side of engine with 14 mm socket. Make sure to save the copper washer below the 14 mm fitting, and once removed, it is a good idea to plug this hole with 1/4-inch rubber stopper to minimize coolant drooling out of the hole.



Remove the two 10 mm bolts holding the fuel rail in place on the engine. Note the location of the wiring and hoses in this area so you can reinstall everything where it needs to go during reinstallation.



Wiggle and pull the fuel rail and fuel injector assembly out of the cylinder head. This should require minimal force. Be very careful—pull up in line with the fuel injectors to avoid causing any damage to the injectors. Tilt the fuel rail to drain any remaining fuel onto a rag before removing from the engine.



The fuel injectors seat into plastic "inserts" in the cylinder head—these inserts should remain in the head but sometimes stick to the fuel injectors when they are removed. If the inserts come out, reinstall them into the head after wiping a light coat of Vaseline on the O-ring seal.

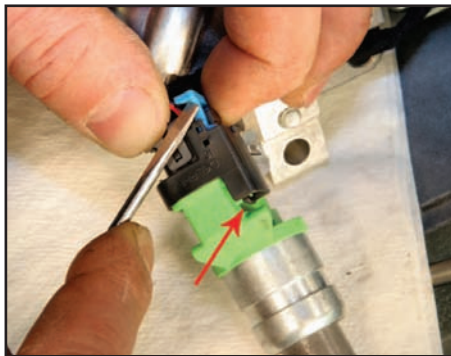


Start to remove the electrical connectors on each stock, green fuel injector. For more on how to perform this activity, refer to the sidebar "Removing electrical connectors from fuel injectors" on the top of the next page.



Note the "clocking" of the injector and retaining clip mounted on the fuel rail—install the Stage 1 injectors in this orientation. Use a screwdriver to lightly pry the injector retaining clips off each injector. These can be reused or the Stage 1 clips that come loaded on the injectors can be used.

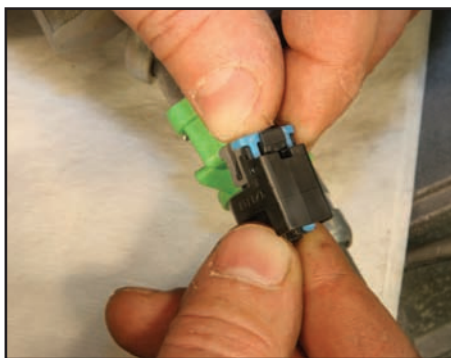
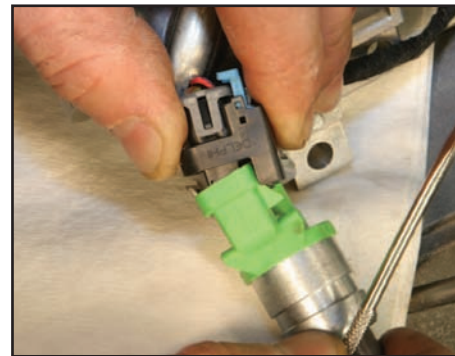
Removing electrical connector detail on fuel injector



Each electrical connector has a blue safety lock that needs to be pulled up, as shown, before the electrical connector release tab can be depressed (in the direction of the red arrow) to release the electrical connector.



Depress the lock on the electrical connector and pull the electrical connector off each injector by gently wiggling and pulling on the connector and injectors until they come apart.



Push the blue safety lock back down after the injector has been removed from the connector in preparation for reinstalling the connector.



Now is a good time to inspect the fuel line fitting to make sure the green plastic washer and blue O-ring are seated in the fuel rail (these usually are nested into this position and will not come out, but it's a good idea to make sure they are there before proceeding).



With the retaining clip pulled off, wiggle each stock injector out of its seat on the fuel rail.

Installing Stage 1 components



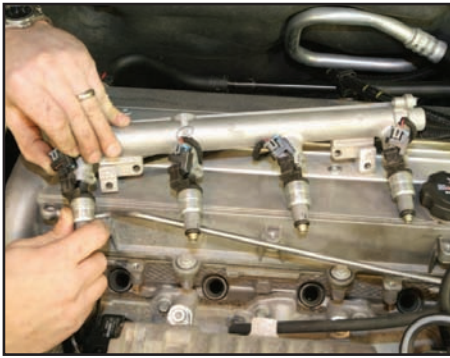
Very carefully wipe a light coat of Vaseline onto the O-rings of each injector.



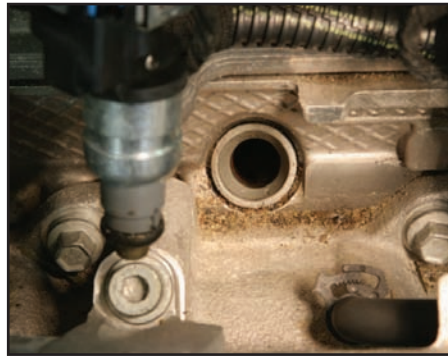
If they are not already on there, install the holddown clips on each of the four Stage 1 injectors. Make sure the open end of the clip is facing the electrical connector.



Line up the tangs in the fuel rail with the grooves in the injector clip to install them correctly.



Carefully install the fuel injector electrical wiring connectors onto each fuel injector. Each connector from the wiring harness really will only reach the correct fuel injector, but for our more talented enthusiasts, make sure the No. 1 cylinder connector is attached to the No. 1 fuel injector. Also, make sure the connector is fully seated on the fuel injector—a loose connection will cause the engine to light up the 'check engine' light.



Make sure the plastic fuel injector spacers that rest in the cylinder head are fully seated by pushing down on them with your finger.



Flip the fuel rail over to prep to reinstall.

NOTE: Check to make sure green washer and blue O-ring are still seated in the fuel rail fitting.

Make sure to position the wiring properly on the engine — not under the mounting bosses. Push on the fuel rail until the fuel rail mounts seat firmly on the cylinder head mounts.



Hand start the threads on the fuel rail hold-down bolts and then torque to 89 in-lbs (10 N-m).



Position the steam pipe in place in front of the cylinder head.



Hand start the threads of the coolant steam pipe bolt and washer into the cylinder head.



Torque the steam pipe bolt to 89 in-lbs (10 N-m).



Apply a light coat of petroleum jelly to the mating surface of the fuel line fitting end. Position the fuel line and fitting together and hand start the threads on it.



Torque the fuel line fitting to 124 in-lbs (14 N-m).



Hand start the threads on the 10 mm fuel line bolt, then torque it to 89 in-lbs (10 N-m).



Reinstall the coolant temperature electrical connector on the sensor that is located on the cylinder head by pushing it onto the sensor mounted to the head. It will "click" when the lock tab is fully seated and will not pull off without depressing the tab.



Tighten the cap back onto the coolant reservoir.



Reconnect the negative end of the battery by sliding the connector over the stud of the battery. Torque the 10 mm (5/16" on Ion) nut to 89 in-lbs (10 N-m).



Without starting the engine, turn the ignition key to the "ON" position for the vehicle—this will initiate the fuel pump to run for a few seconds to pressurize the fuel rail. Wait about 10 seconds and turn key off and then back on. Do this sequence three times before moving to the next step.



Check for leaks at the fuel lines. If there are any leaks, inspect to make sure the mating points are properly aligned and threaded on. If they are, retorque the fittings and reinspect with system under pressure. If everything is dry, crank the engine until it starts. Let it run while you check the fuel rail again for leaks.



If no leaks are found, shut the engine off and install the engine cover with the two T30 Torx.



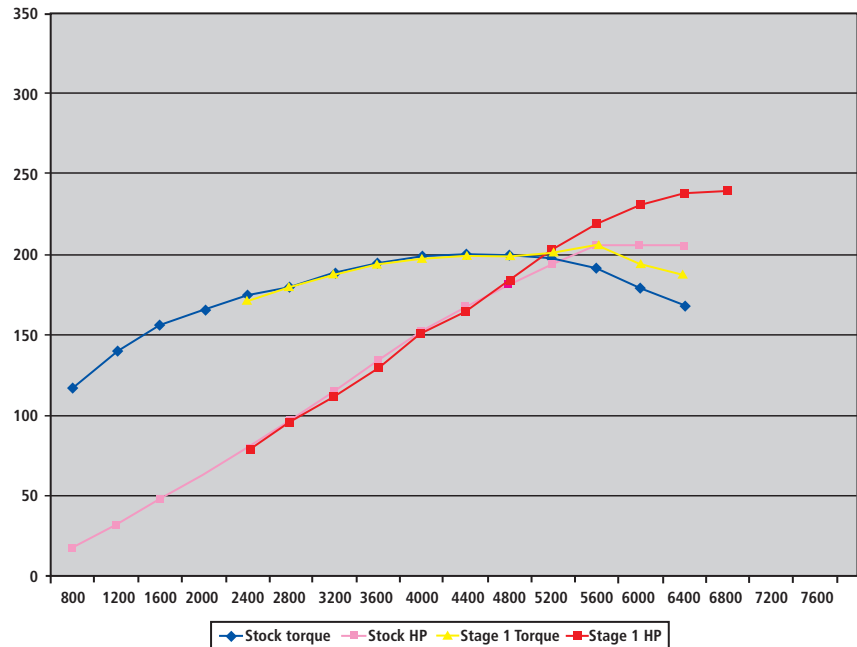
Torque the T30 Torx bolts to 89 in-lbs (10 N-m) and Install the Stage 1-supplied EO sticker over the stock engine sticker under the hood.



Cautiously drive your Stage 1-equipped vehicle to a GM dealership as soon as possible to receive the Stage 1 performance calibration. A Stage 1-upgraded vehicle can be driven a few miles with the stock cal in it, but you need to get the Stage 1 software installed in the Powertrain Control Module (PCM) before any performance driving is attempted. As with the base Ecotec 2.0L supercharged LSJ engine, it is recommended you run premium fuel to take full advantage of the performance components.

Dyno Results for Stage 1 vs. Stock 2.0L supercharged Ecotec (RPO - LSJ)

Notes: While the stock LSJ Ecotec makes a solid 205 hp from 2.0L, the Stage 1-equipped LSJ pumps out 236 hp at 6600 rpm, a lift of 31 peak hp.!



Stage 2 Kit Installation

Well, here you go! Now's the time to install one of the most powerfull GM-engineered, easy-to-integrate, cost effective and emissions-legal upgrades on your street Cobalt SS-SC or Ion Red Line. The steps you'll encounter to install the GM Performance Stage 2 upgrade kit are shown here with a photo and simple explanation. Ask anyone who's bolted a Stage 2 kit on their ride, they'll tell you the power is awesome and you'll wonder why it isn't on your car.

Installing the Stage 2 performance components requires removing and reinstalling the fuel injector rail and the supercharger, but both of these steps are detailed in the following photos, so you will be able to understand exactly what this process requires to upgrade your vehicle.



Bolting on serious power has never been so easy! The GM Performance Stage 2 upgrade kit for the Ecotec 2.0L supercharged engine (RPO - LSJ) pumps the power up over the entire powerband making for a truly exciting ride.



The Stage 2 upgrade kit for the LSJ Ecotec is a true step up from the Stage 1 kit. The Stage 2 adds a specially designed blower pulley and belt, and a powertrain control calibration that takes advantage of the increased boost generated by the smaller Stage 2 blower pulley.



Start the install of the Stage 2 upgrade kit by locating the fuse block—in this case, this is a Chevy Cobalt SS Supercharged fuse block located under the hood. (for accessing the Ion Red Line fuse block, see the beginning of this chapter in the Stage 1 install section).



Pull out the fuel pump relay while engine is running to bleed off fuel pressure.



Start vehicle and run until engine stumbles and shuts off. Locate battery in trunk under carpet and disconnect the negative battery cable by loosening the 10 mm (5/16-inch on Ion) lockdown nut.



Unbolt the "Ecotec" engine cover by removing the two T30 Torx bolts.



Remove 10 mm bolt holding fuel rail onto engine.



Unbolt the fuel line fitting by loosening the 24 mm fuel line nut. Use a 21 mm wrench to pull on to avoid damaging the fuel rail. Be careful as some pressurized fuel might spray out when this fitting is loosened, so cover the fitting with a rag as it is loosened.



Some fuel will leak out of the fuel rail after it is loosened and removed, so place a rag around/underneath the fitting to catch this fuel.



Remove the steam line fitting with 14 mm socket.



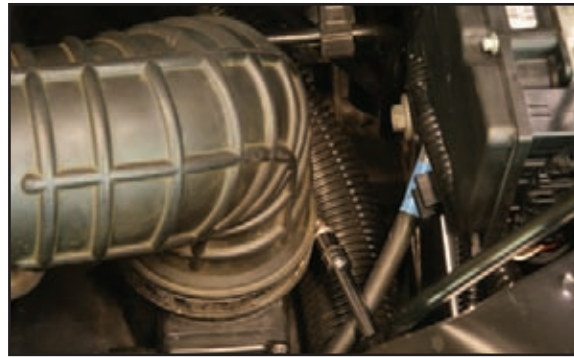
Make sure to save the steam line bolt and washer for reinstallation.



Remove the temperature sender electrical connector on the cylinder head by depressing the lock tab on the wire end of the connector and pulling up.



Remove the two 10 mm bolts holding the fuel injector rail onto the engine and pull up on the rail while slightly wiggling it. Once off, disconnect the fuel injector wiring. For more on this step, see the section titled "Removing Electrical Connector Detail on Fuel Injector" in the Stage 1 install section.



The supercharger removal starts with removing the inlet duct that connects the air cleaner to the throttle body. On the Cobalt, this requires loosening two 8 mm hose clamps at each end of the hose; the Ion has 7 mm bolts on these clamps.



Start removing the hose by pushing it off the throttle body flange as shown.



Pull the hose up off the air cleaner flange and out of the vehicle like this.



Remove the brake booster hose on the housing of the blower. The detail photos (middle and right) show you how to compress the two tabs on the bottom side of retainer and push the tabs out the side of the retainer housing to allow the retainer to be gently pulled off the flanged fitting attached to the blower housing.



Remove the evaporator-purge hard line fitting by rotating the tab downward on the fitting to unlock it from the nipple on the solenoid. Take a look at the photo on the right to see how the fitting locks on the nipple.



Remove the vacuum hose for the EVAP purge line from the nipple on the throttle body by rotating tab downward on the fitting to unlock the fitting and gently pulling it off.



Remove the map sensor electrical connector by lifting the lock tab and pulling connector off the blower housing.



Use a hook tool to assist in getting the bypass hose to slide off the nipple of the boost bypass solenoid near driver's side of cylinder head of engine.



Remove the two 10 mm bolts that hold the coolant reservoir for the intercooler.



You can either disconnect the electrical connector on the bottom of the throttle body (not easy if you haven't done it before), or disconnect the four bolts holding the throttle body on the supercharger body. We'll show you the throttle body removal, as it is easier on your first Stage 2 install. To start, remove the four 10 mm bolts holding the throttle body on the supercharger.



As you remove the throttle body, capture the red O-ring that seals the throttle body to blower and place it in a safe location for reuse. Place the throttle body off to the side in the engine bay.



Moving over to the pulley and belt area of the supercharger, now is the time to release the tension on the drive belt by placing a 15 mm open-end wrench or a “flank drive” open-end wrench on the belt tensioner. The tensioner is cast and sometimes hard to “grab” with a regular open end wrench, but the flank drive wrench will help considerably. Slowly push down and back toward the firewall, as the hydraulic tensioner depresses, until the tensioner bottoms out. Then carefully work the belt off the supercharger pulley with your hand. Leave the belt on the rest of the engine front drive until replacing it with Stage 2 belt in a future step.



Remove the four 6 mm bolts holding the supercharger onto the intake manifold. There are two little black plastic “guides” that nest in the top of the supercharger bolt holes. Make sure these don’t get lost as you’ll need them to reinstall the blower.



Helpful Tip: One trick many people servicing this vehicle do to keep all the parts in one place is to place all the fasteners and other parts up on the cowl of the vehicle as you remove them. You can also place everything in a tray on your workbench—the key is to put everything in one place.



Carefully lift the supercharger out of the engine bay making sure nothing falls down into the opening in the intake manifold. As the blower comes off the intake, maneuver it toward the driver’s side of the vehicle to clear the radiator hose.



This is one of the two black plastic guides that nest in two of the bolt holes on the blower. Be careful to not let these drop into the intake upon supercharger removal. They hold the supercharger bolts.



These two metal locating pins seat in the intake manifold (arrows) and have a tendency to stick to the blower housing. Make sure they don't fall down into the opening in the intake! If the pin(s) stay in the blower when it is pulled out, pull them out and reinstall them in the intake. Place some tape or a rag over the intake opening to minimize chances of something falling into the engine.



It is a good idea to make sure the supercharger bypass seal is still in place on the intake manifold (right hand pointing to it) and that the metal guide pins are installed in the intake before going on to the next step (left hand).



Now is the time to remove the stock front drive belt off the engine. This mostly requires lightly wiggling to get it off the crank pulley and out from between the body and engine.



Even more exciting than removing the stock belt is weaseling the Stage 2 belt into the space between the big crank pulley and the front of the engine. Start by pinching the belt down like this when starting to push the belt into place over the crank pulley.



To get the belt on the crank pulley, it usually works best to use a long screwdriver or pry bar to lightly maneuver the belt onto the big crank pulley while lightly wiggling the belt in your other hand. This is tight and your vision into this space is limited, so be patient!



Once the belt is on the crank pulley, loop Stage 2 belt over the tensioner pulley and under the alternator pulley in preparation for looping the belt over the blower pulley when it is installed.

—Installing the Stage 2 pulley on blower—

This portion of the Stage 2 performance upgrade install requires a standalone hydraulic press. If you don't have access to one, it is recommended you take your blower to a local machine shop to have them perform the removal of the stock pulley and installation of the Stage II pulley. The following steps in the process show the stock pulley removal and Stage 2 performance pulley installation.



With the supercharger unbolted from the vehicle, it can be placed in the press with the pulley captured by press plate anchor points on the hydraulic press. The supercharger will actually be hanging by the pulley as the press pushes the supercharger main shaft out of the stock pulley.



A shaft arbor extension needs to be used to allow the press to push the blower shaft out of stock pulley. Some enthusiasts have used a 13 mm or smaller deepwell impact socket as this spacer, but a dedicated arbor is recommended.



With the press making its downward stroke pushing the shaft out of pulley, be prepared to "catch" the supercharger when it comes free of the stock pulley.



With the blower on a bench, situate the Stage 2 mounting hub with the deep shoulder toward the outer edge of the shaft. The Stage 2 pulley mounts to this hub.



There are a few ways to install the Stage 2 pulley hub. One way is to use a power steering pulley installer with a 8 mm x 1.25 pitch threaded rod to thread into shaft (Kentmore P/N J-38823). With this unit, you thread the installer through the pulley hub and into the internal threads on the supercharger shaft before tightening the installer down until the Stage 2 hub sits flush with the end of the supercharger shaft.



This is what an installed Stage 2 hub will look like on the supercharger shaft.



Next, the Stage 2 pulley is positioned on the Stage 2 hub and the Stage 2-provided fasteners carefully threaded through the pulley and into the hub. Be careful getting these started properly on the threads as these are a tight interface!



The Stage 2 performance upgrade kit comes with a special tool to tighten the hub/pulley bolts.



Place the Stage 2 hub/pulley fastener tool into an 8 mm socket on a large ratchet to tighten the bolts in a radial pattern.



These fasteners will be torqued once the blower is back on the vehicle and the belt is holding the pulley in place, so just get the fasteners hand tight and move on to the next step.

Reinstalling the supercharger



With the Stage 2 pulley installed, now it is time to reinstall the supercharger. To start, make sure the metal aligning pins are located in the intake manifold bolt holes and that the supercharger-to-intake-manifold gasket is seated in its groove. Also make sure the bypass seal is properly situated on the intake before installing the blower.



After pushing any wires/hoses/etc out of the way, position the supercharger onto the intake with the metal locating pins in the bolt holes. Gently push the supercharger down onto the intake manifold to seat it in place.



Make sure the two black plastic locaters that sit in the bolt holes are positioned properly to locate the blower bolts.



Now, install the four 6 mm hex supercharger bolts to intake manifold bolts and torque them to 18 ft-lb (25 N-m).



Now is the time to install the Stage 2 belt on the Stage 2 equipped supercharger. To start this step, make sure the belt is fully installed on all the pulleys—especially the air conditioning pump pulley as this often will become misaligned during the belt reinstall process. Compress the tensioner with a 15 mm open end wrench while working to string the belt back over the tensioner pulley.



Here is what the Stage 2 belt should look like at final installation. As a precaution, inspect all pulley/belt interfaces to make sure the belt is properly seated on the pulleys before moving on to the next step.



Now with the belt holding the pulley tightly, and a pry bar wedged against the pulley, torque the four custom Stage 2 bolts to 16 ft-lb (22 N-m) in radial pattern using the Stage 2 tool in 8 mm socket.



Reinstall the throttle body by first making sure the red O-ring seal in the supercharger flange is seated properly in its groove.



Install the throttle body on the supercharger flange and hand start the threads on the four 10 mm bolts.



(Left) Torque throttle body bolts to 89 in-lb (10 N-m) in a radial pattern.

As an aside, if you are not familiar with setting the value on a torque wrench like this, it is accomplished by lifting the "lock ring" and turning the handle until the appropriate torque value on the numbered shaft matches with the indicator on the handle (for instance, this in-lb torque wrench is set to 'click' at 89 in-lbs: $85 + 4 = 89$).



Hand start the threads on the two 10 mm bolts that hold the intercooler reservoir onto the supercharger housing and torque the bolts to 89 in-lb (10 N-m).



Push the MAP (manifold air pressure) sensor electrical connector onto the MAP sensor.



Install the vacuum line onto the bypass solenoid.



Install evaporative system line at both the controller and supercharger housing (see steps in the Stage 1 Install for details of how they were removed) by pushing the connectors over the mounting nipples.



Install the brake booster line onto the side of the supercharger housing and push down on the white "C" clip lock to ensure that the line stays installed.



Reinstall the air cleaner to supercharger induction tube and tighten the two hose clamps to 89 in-lbs (10 N-m).

Cobalt SS Note: The cross section of one side of the upper clean air duct is oval shaped. Do not over-tighten this clamp, as it will deform the tube, causing air leaks and poor operation of the engine.



—Install Stage 2 fuel injectors



Apply a light coat of vaseline to the injector O-rings and install the Stage 2 fuel injectors onto the fuel rail (for more detail on this, see the Stage 1 injector install). Position the fuel rail over the engine with the fuel fitting on the passenger's side and install the electrical wiring onto each injector (for more on this, see the Stage 1 install).



Make sure the factory fuel injector spacers are properly located in their bores in the cylinder head.



Install the fuel rail with the fuel injectors loaded on it into cylinder head. Carefully push down on the fuel injector rail until the rail mounts seat close to the cylinder head mounting bosses.



Hand start the two 10 mm bolts into the bosses and torque the fuel rail bolts to 89 in-lbs.



Pivot the steam pipe back over the front of the engine in preparation for reinstalling the steam pipe bolt.



Hand start the threads on the steam pipe bolt after positioning the brass washer between the steam pipe flange and the cylinder head.



Torque the steam pipe bolt to 89 in-lb (10 N-m).



Position the fuel line onto the engine and hand start the fuel line fitting onto the fuel rail. Before threading this on, it is a good idea to wipe a light coat of Vaseline on the mounting interface of the fuel rail and inspect this fitting to make sure the two O-rings that seal this point are in place.



Torque the fuel line fitting to 124 in-lb (14 N-m) with 24 mm and 21 mm wrenches.



Hand start the threads on the 10 mm hold-down bolt for the fuel rail and torque to 89 in-lbs (10 N-m).



Reinstall the temperature sender electrical connector onto the sender by pushing it on until the lock clip clicks into place.



Hand tighten the coolant tank cap.



Reconnect the negative battery cable and torque to the cable end nut to 89 in-lbs (10 N-m).



Turn the key to on to cycle the fuel pump and pressurize the fuel rail. If inspection of fuel system shows no leaks, start vehicle and inspect under the hood.



Check your work for any leaks in the fuel system, coolant system (at the steam pipe) and any other areas you disassembled. Make sure all electrical connections are firmly on their mating points and all tools have been removed from under the hood.



With the engine inspected for leaks and deemed sound, install the engine cover onto the engine, hand start the two T30 Torx engine cover bolts and torque them to 89 in-lbs (10 N-m).



This is what your engine should look like after completing the installation of the Stage 2 performance upgrade kit.



Now is the time to take your Stage 2-parts equipped vehicle to a GM dealer to have appropriate performance calibration flashed into vehicle's Powertrain Control Module (PCM). Also, you should install the Stage 2-supplied EO sticker over stock sticker under the hood and continue to use premium fuel for maximum power output from your now over 240 hp rocket!

Dyno Results for Stage 2 vs. Stock 2.0L supercharged Ecotec (RPO - LSJ)

Notes: While the stock Ecotec LSJ makes a solid 205 hp from 2.0 L, the Stage 2-equipped LSJ pumps out 241 hp at 6600 rpm, a lift of 36 peak hp. Notice the

improvement in power output over the entire powerband—this is what you'll feel driving your Stage 2-equipped hot rod around town.

