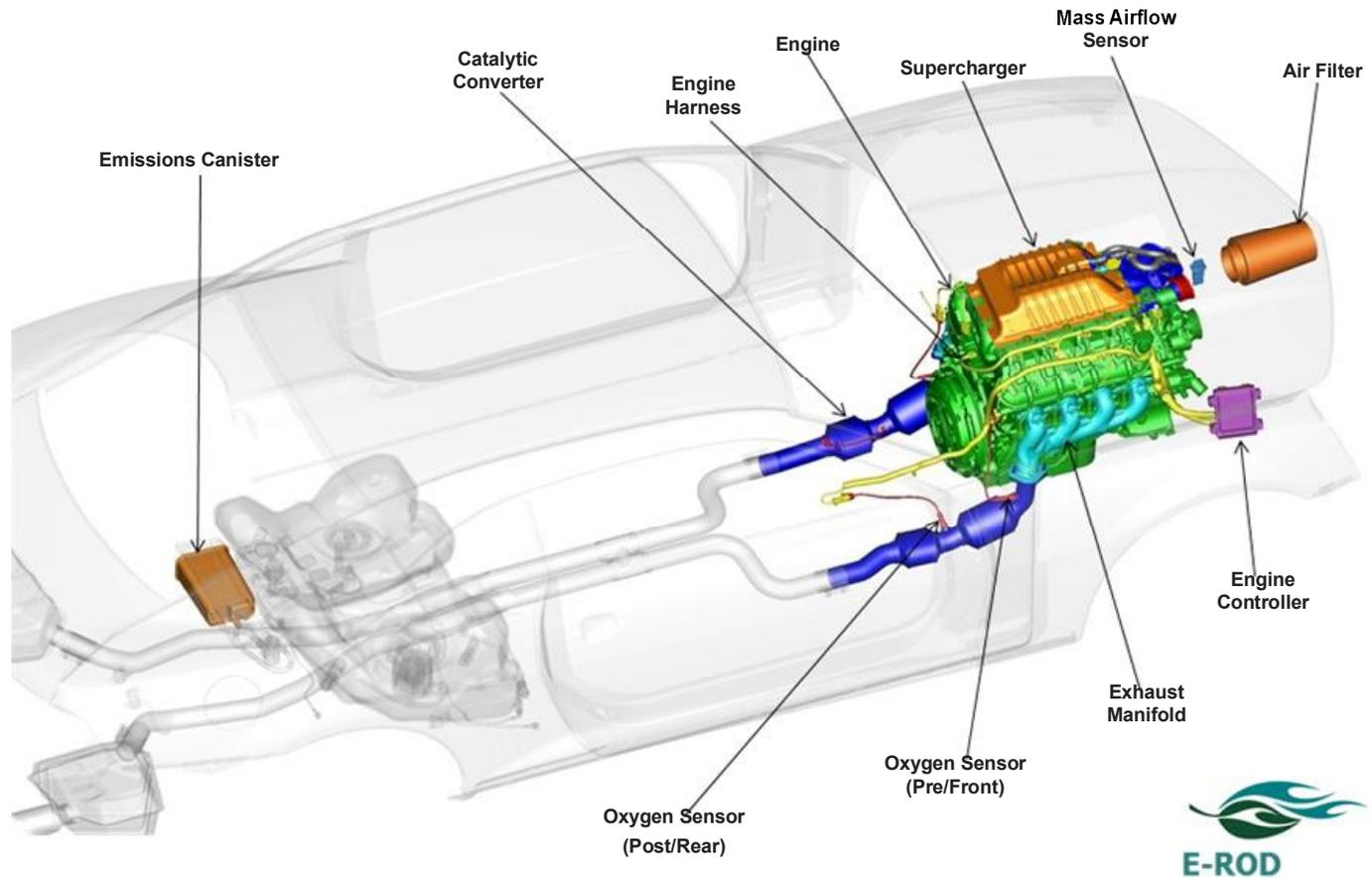


LSA E-Rod Crate Engine Control System



Thank you for choosing Chevrolet Performance as your high performance source. Chevrolet Performance is committed to providing proven, innovative performance technology that is truly... more than just power. Chevrolet Performance parts are engineered, developed and tested to exceed your expectations for fit and function. Please refer to our catalog for the Chevrolet Performance Parts Authorized Center nearest you or visit our website at www.chevyperformance.com.

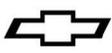
This E-ROD control system is a, fully-integrated, 50 state Emission Certified kit designed to run the Chevrolet Performance LSA series crate engines. Included in the kit are the engine, engine control module (flashed with the appropriate calibration), engine harness, accelerator pedal, mass air flow (MAF) sensor, MAF sensor mounting boss, oxygen sensors (4), and oxygen sensor mounting bosses (4). This control system requires a fuel system which is capable of 600 kPa (87 psi) pressure that is vacuum referenced and can deliver 65 gph (gallons per hour). Vehicle performance/driveability and engine durability may be affected if the correct pressure or flow are not maintained.

IMPORTANT: Read the 'System DOs and DON'Ts' section below before attempting to install the engine and then review again before attempting start the vehicle. Note that if the engine will not come off idle after the control system installation, check for an illuminated MIL (malfunction indicator light, which is located in the fuse/relay center, sometimes called the "Check Engine Light" or "Service Engine Soon" light) which indicates stored fault codes. Check for codes and make any required repairs if the MIL is illuminated (typically it is a connector issue or a wiring issue), consult a service manual if necessary (2010- 2012 Cadillac CTS or 2012 Camaro).

Observe all safety precautions and warnings in the service manuals when installing this package in any vehicle. Wear eye protection and appropriate protective clothing. Support the vehicle securely with jack stands when working under or around it. Use only the proper tools. Exercise extreme caution when working with flammable, corrosive, and hazardous liquids and materials. Some procedures require special equipment and skills. If you do not have the appropriate training, expertise, and tools to perform any part of this conversion safely, this work should be done by a professional.

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	28JN12	Initial Release - William Duncan	N/A



System DOs and DON'Ts:

Do:

- Ensure all intended engine/vehicle side connections are made before connecting ignition or battery power to the system.
- Ensure the wiring harness is secured as required, and that the routing avoids locations which can potentially damage the wiring (e.g.: sharp edges, pinch points, rotating components, exhaust components, etc.). Make sure any unused connectors or wiring are properly secured and protected (sealed or taped as required to avoid short circuiting).
- Ensure all engine and wiring harness grounds are clean and secure. Minimum 3/4 inch braided strap from the engine to the vehicle chassis is recommended.
- Ensure the MAF sensor is oriented correctly in the induction (it will only read correctly in the proper direction). An arrow is located on the sensor indicating correct flow direction. Verify this before welding the mounting boss, as the sensor will mount only one way in the boss.
- Ensure the MAF Sensor is mounted in the middle of a minimum 6 inch length of 4 inch diameter straight tube, and is a minimum of 10 inches from the throttle body.
- Ensure the fuel pressure is capable of 600 kPa (87 psi) with the engine running. The pressure regulator must be vacuum referenced.
- Ensure the fuel pump has the following flow capability: **Minimum 65 gph @ 600 kPa (87 psi)**.
- Ensure battery voltage is connected using a minimum 8 gauge wire to the horizontal stud on the fuse block. See Connections section for details.
- Ensure that the accelerator pedal clearances meet the guidelines below.
- Ensure that the provided oil pressure sensor is installed and torque to 35 nm (26 lb-ft)

Don't:

- Change or alter any wiring in the accelerator pedal or electronic throttle systems.
- Solder or alter any Oxygen Sensor wiring.

Vehicle Requirements

Maximum Vehicle GVWR (Gross Vehicle Weight Rating)

6.2L LSA Engine – 5725 lbs or less

Vehicle Speed Input

The ECM is programmed and looking for 40 pulses per revolution typical for automatic transmissions. The LSA Control System harness is designed to plug into the output speed sensor of 4L60 & 4L80 Transmissions, which have a 40 pulse output.

NOTE: The vehicle speed input must be plugged in.

Axle Ratio and Tire Size Requirements

The axle drive ratio in the calibration is set to 3.42:1 and is ok for ratio from 3.08 to 4.11. Tire diameter needs to be between 26" and 30". **NOTE: For optimal performance choose an axle ratio and a tire size with-in the recommended range.**

NOTE: All Engines are generally shipped with an automatic transmission flex plate. For flex plate and flywheel options see www.chevyperformance.com. For manual applications, the clutch and flywheel used must be purchased separately and is up to the end user. See our website for recommended CPP clutches and flywheels.

Also see the Chevrolet Performance Catalog or www.chevyperformance.com for recommended accessory drive, starter, flywheel and clutch components.

NOTE: The parts listed here may have been updated or superseded, go to www.chevyperformance.com for the latest part number list.

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Parts List:

These instructions cover the following packages:

- 19257456 LSA 6.2L (40T – Required for Auto Transmissions & SOME Manual Transmissions)
- 19257460 LSA 6.2L (17T – Required for MOST Manual Transmission)

Each Kit includes the following engine:

6.2L RPO LSA Engine assembly, including intercooler pump

Parts included in all of the above packages:

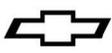
- 20941740 Catalytic Converter (Left)
- 20941739 Catalytic Converter (Right)
- 17113332 Emissions Canister
- 12611638 Exhaust Manifold (Left)
- 12611639 Exhaust Manifold (Right)
- 92202326 Seal- Exhaust Manifold Qty-2
- 19202661 Dry Air Filter Element
- 15032594 Nut-Exhaust Manifold Pipe (M10x1.5) Qty-4
- 19257457 LSA E-ROD Emissions Control Kit
- 92202996 Clamp - Exhaust

Emissions Engine Control Kit consists of the following parts:

- 19257458 LSA (40T – 40 tooth trans speed signal) with 19210737 Engine Control Module
- 19257462 LSA (17T – 17 tooth trans speed signal) with 19210737 Engine Control Module
- 19244453 LSA Engine Harness
- 19299067 I-Sheet (Instruction Sheet)
- 15865791 Mass Airflow Sensor
- 19166574 Mass Airflow Sensor Bracket
- 10379038 Accelerator Pedal
- 12581966 Oxygen Sensor, Front Qty-2
- 12611165 Oxygen Sensor, Rear Qty-4
- 15156588 Oxygen Sensor Mounting Boss
- 19258210 Emission Certification Labels, LSA (40T) & (17T)
- 19300176 Bolt – MAF Sensor mounting–(M4x0.7x8mm) Qty-2
- 19300177 Washer–MAF sensor mounting screws–(4mm) Qty-2

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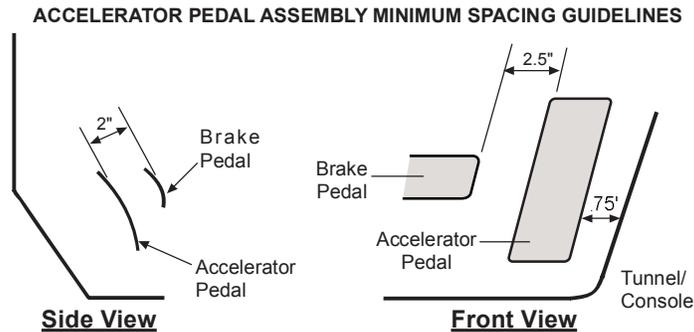
Installation Instructions:

ECM

The Engine Control Module (ECM) is environmentally sealed and can be mounted under hood, however, avoid extremely hot locations (exhaust, etc.) or high splash areas. It is not recommended that the ECM be mounted directly to the engine.

Accelerator Pedal

Mount the accelerator pedal per the following dimensional guidelines, mounting details are application-specific and are left to the user. Ensure that the pedal is securely mounted to the vehicle. A grommet is required in any sheet metal hole that the harness routes through to avoid wire damage.



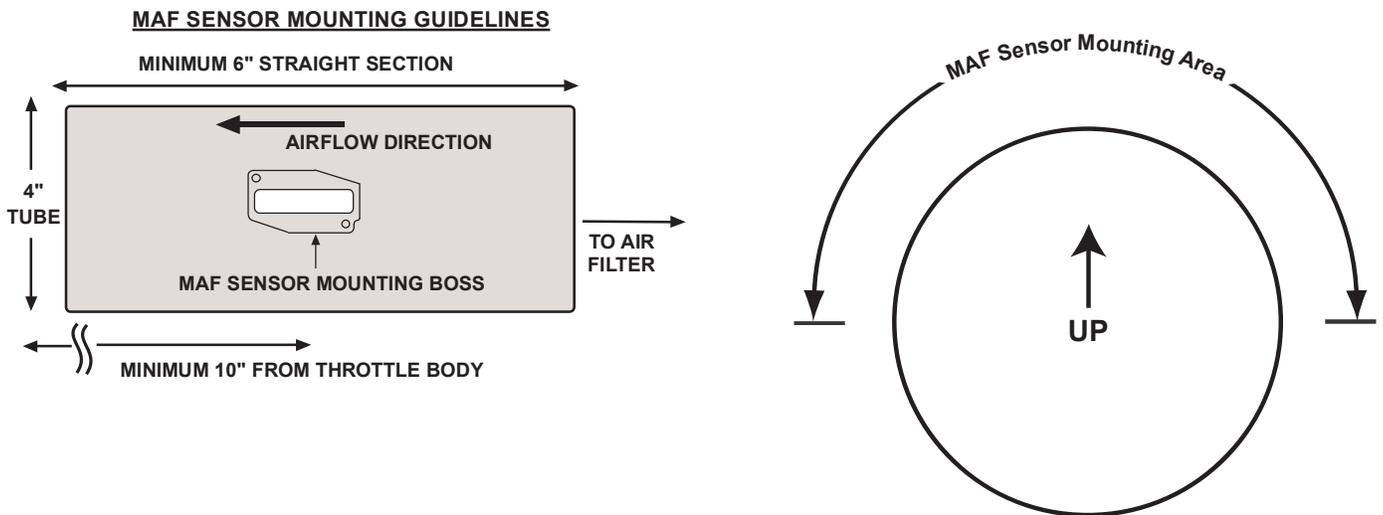
Mass Air Flow (MAF) Sensor

NOTE: It is critical that the MAF sensor is mounted per the instructions below. Vehicle performance and/or driveability may be affected if it is not mounted as recommended.

The mass air flow sensor must be installed in the induction system using the supplied MAF sensor mounting boss. The induction system should be 4 inches in diameter and have a minimum straight section 6 inches in length. Mount the MAF sensor in the middle of the straight induction section, ensuring that the middle of the mounting boss is at least 10 inches from the throttle body.

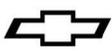
The MAF sensor must be oriented correctly in the induction system – note the arrow on the sensor indicating flow direction. Be sure to weld the mounting boss correctly – the sensor will only mount one way in the boss (see diagram).

Weld the boss in place before installing the sensor. When installed in the vehicle, the MAF sensor should be mounted with the connector end pointing between horizontal and fully upright – do not mount with the connector oriented downward.



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Air Cleaner

It is recommended that the provided dry element air cleaner be used. However, if an alternative air cleaner is used it must be of the dry element variety. **NOTE: Emissions compliance and fueling cannot be guaranteed if a different part is used.**

Oxygen Sensors

NOTE: It is critical that the Oxygen Sensors are mounted per the instructions below. The exhaust system MUST be properly sealed – any leak near the sensors (upstream or downstream) can cause incorrect operation of the fuel control system. Vehicle performance and/or driveability may be affected if sensors are not mounted as recommended or if an exhaust leak exists. Leak check the exhaust system to ensure adequate sealing (even small leaks can affect fuel control).

Pre-Catalysts (Front) Oxygen Sensors should be mounted in the provided locations. If they are not available in your installation use the collector area of the exhaust system in a location that allows exhaust from all cylinders to be sampled equally. Be sure the connectors and wiring are routed away from high heat areas. The oxygen sensors should be mounted with the sensor tip pointing between horizontal and fully downward – do not mount with the tip oriented upward. Weld in the mounting bosses supplied (7/8" hole) if required.

Post-Catalysts (Rear) Oxygen Sensors should be mounted in the provided locations in the catalyst assembly. It is highly recommended that the Oxygen Sensor bosses in catalyst assemblies be used without modification. If they need to be moved or mounted differently to fit your vehicle, the sensors need to be mounted the same distance from the rear of the front catalyst's brick/honeycomb as the unmodified catalyst assembly. The oxygen sensors should be mounted with the sensor tip pointing between horizontal and fully downward – do not mount with the tip oriented upward.

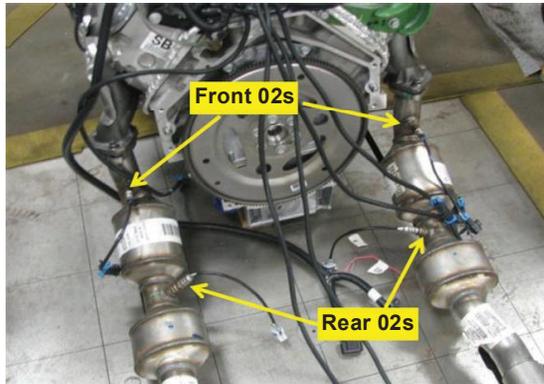
Exhaust Manifolds

It is recommended that you use the provided exhaust manifolds or similar LS Engine style Exhaust Manifolds.

Catalytic Converters

NOTE: It is critical that the Catalytic Converters are mounted per the instructions below.

The provided catalytic converters, LH #20941740 and RH #20941739 must be mounted between 16" to 20" from the closest cylinder head exhaust port face. Be careful not to mix up left and right hand converters (see the picture below) . Rear oxygen sensors should angle toward the center of the vehicle.



Positive Crankcase Ventilation System (PCV)

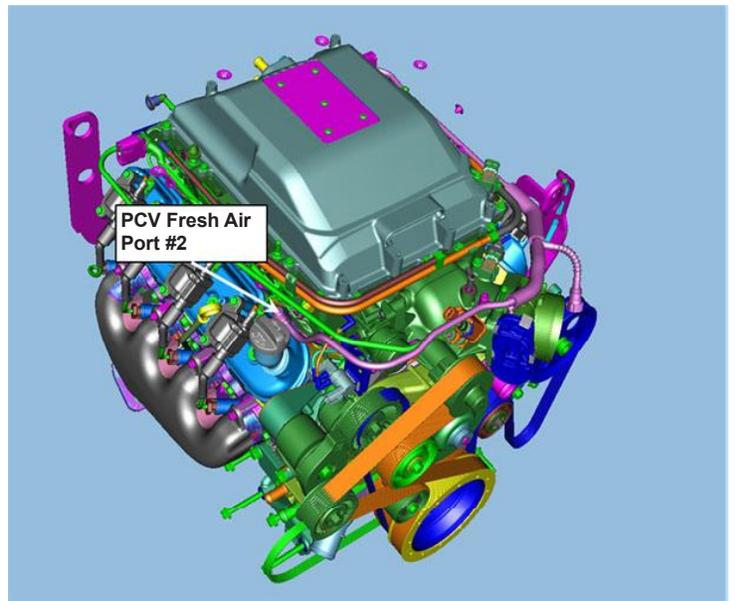
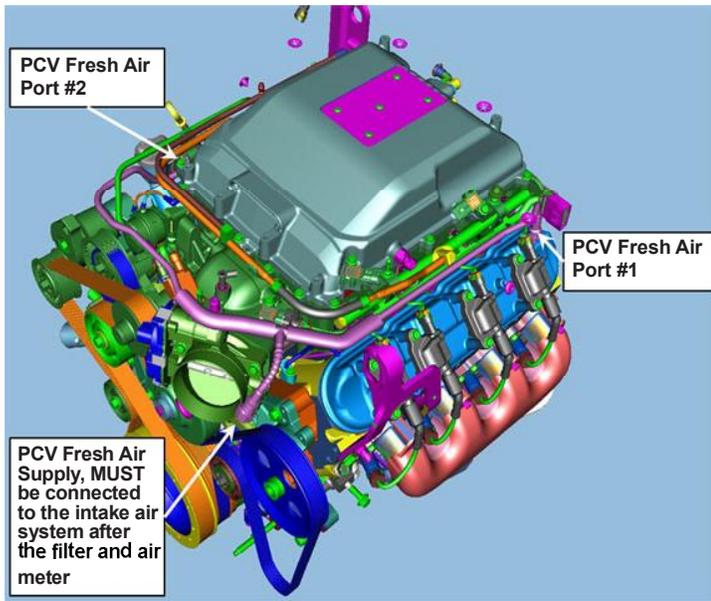
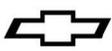
How to set up your PVC system:

There are two ports on the engine that make up the PCV system. The ports on the engine are 1). Left rear (driver side) valve cover. 2) Right Front (passenger side). The ports with silver tubes may look simple but, they should not be modified. The tubes have a small orifice within them that is used in place of a PCV valve of earlier designs. These ports must be connected to filtered clean air. This connection must be within the engines air cleaner system and must be between the MAF (Mass Air Flow Sensor) and engine's throttle body. The engine burns the air that enters the PCV system so, if the fresh air port is prior to the MAF then, this air will enter the engine without being measured by the MAF and adverse engine operation may occur.

The vacuum source for the PCV comes already connected on your engine and must be maintained.

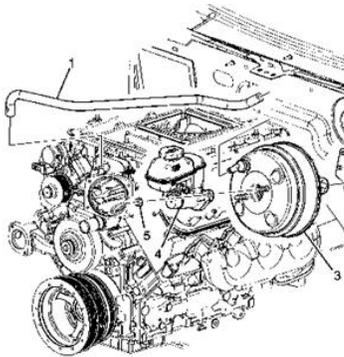
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Power Brake Booster Vacuum Source

The vacuum port for the Brake Booster is a plug in the front of the intake manifold behind the throttle body.



Charge Air Cooler System

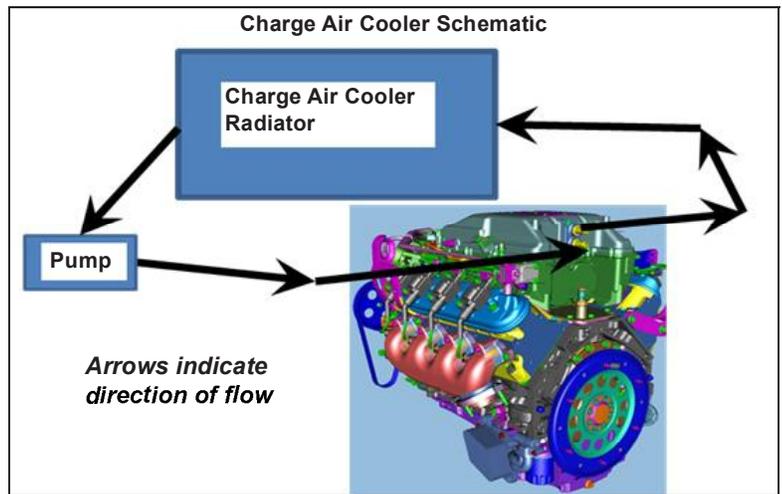
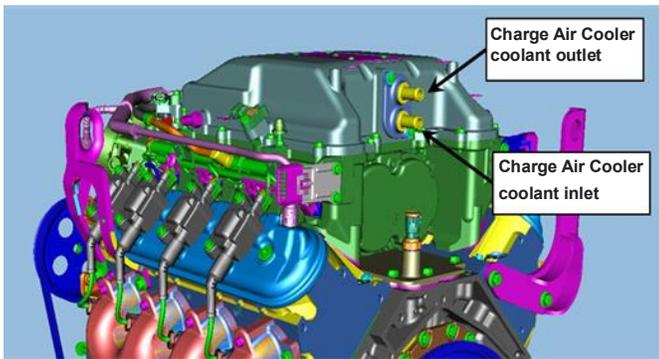
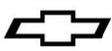
The cover assembly has an integrated intercooler. The intercooler uses conventional coolant in a system that is separate from the engine cooling system. The intercooler assembly includes the cover, a charge air cooler/heat exchanger and a variety of sensors to monitor air temperature and pressure. The charge air cooler pipe assembly, located at the rear of cover transfers coolant to the intercooler cooling system via vehicle coolant hoses. The charge air cooler pipe assembly is sealed to the charge air cooler with O-rings and a press-in-place seal. Coolant enters the inlet port of the assembly, is directed into and through the charge air cooler/ heat exchanger, and exits returning to the separate cooling system.

An intercooler cooling system is required to ensure that heat can be removed from the coolant. The system must include appropriately sized lines, radiator, and pump (minimum 5.5 gallons per minute flow rate which is included in this kit) to ensure the coolant temperature remains in an acceptable range, especially during high boost operating ranges (eg: heavy accelerations, high throttle positions, etc). **For optimal performance, it is recommended that the coolant temperature be kept below 95 degrees F at the intercooler inlet. It is critical that this temperature be kept below 175 degrees F for safe engine operation.** Use of production components is recommended whenever possible however the plumbing, radiator and reservoir are up to the customer.

An intercooler pump is provided with your CPP Crate Engine. **In order to ensure adequate cooling the pump must be capable of 24 L/min or 400 gal/hr at greater than 90 Kpa. CPP p/n 13581479 (provided) meets these requirements.** The intercooler hoses are connected to the rear of the supercharger cover. The Charge Air Cooler coolant inlet is the lower connection on the rear and the outlet is the upper connection. The charger air cooler system must be plumbed according to the schematic below:

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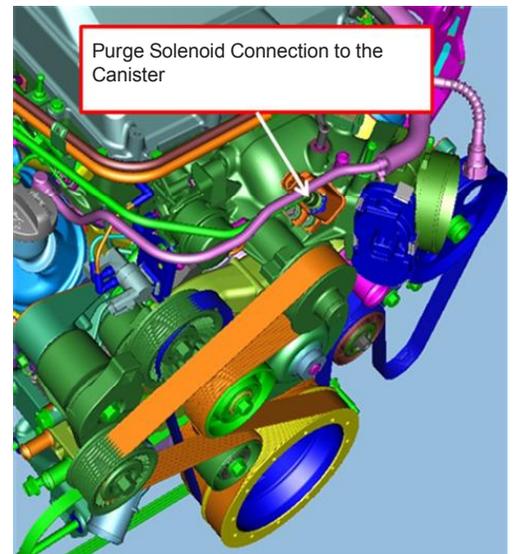
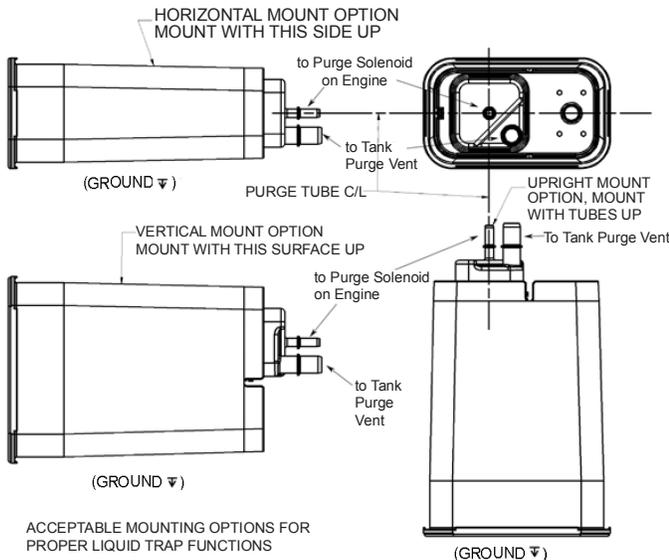
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Evaporative System

Your kit comes with an evaporative emissions canister. The canister can be mounted anywhere between the tank and the engine (It is not recommended to mount the canister on the engine itself). This canister needs to be plumbed to the fuel tank vapor line and to the purge solenoid on the engine. It is important that you use an evaporative compatible fuel tank system so that the fuel tank is not vented to atmosphere.

NOTE: It is also very important that the fuel tank have a vapor dome. A tank with a vapor dome is a tank that has approximately 10% of its volume capacity left unfilled after a maximum fill so that the fuel vapors can be routed from this volume to the canister. On some tank systems it may be necessary to have a liquid check valve installed in the vapor line between the tank and the canister to prevent liquid fuel from being sucked into the canister. To comply with evaporative system and on-board vapor recovery system (ORVR) regulations, fuel system components (fuel tank, fill pipe, and fuel cap) must be equivalent to those offered by large volume OEM's for 2006 model year or later vehicles. The hoses should be constructed of fuel rated metal or synthetic polymer material that meet the permeation requirements outlined in SAE J30R9. The hose connection points should comply with the specifications outlined in SAE J2044.



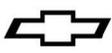
Engine Wiring Harness

The following lists the engine and vehicle side connections. Optional circuits are described in the 'System Features' section below. **NOTE:** A Malfunction Indicator Lamp (MIL- sometimes called a "service engine soon" light) is mounted inside the fuse/relay center. A redundant MIL output is also available in the harness near the pedal module connector. It is recommended that a MIL also be installed in a visible location in the passenger compartment. This circuit requires any 12v low current light and an ignition 12v power source. The ECM MIL output supplies the ground for the circuit.

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Connections Required for Correct Operation

- Coolant Sensor – 2 pin connector
- Mass Air Flow (MAF) Sensor – 5 pin connector
- Camshaft Position Sensor – 3 pin connector
- Electronic Throttle Control – 6 pin connector
- Manifold Absolute Pressure (MAP) Sensor – 3 pin connector
- Pre-Converter or Front Oxygen Sensors (2 total) – 5 pin Connectors
- Post –Converter or Rear Oxygen Sensors (2 total) – 5 pin Connectors
- Intake Air Temperature Sensor – 2 pin connector
- Barometric Pressure Sensor – 3 pin connector
- Supercharger Boost Control Solenoid – 2 pin
- Inter Cooler Pump Control – 5 pin connector
- Knock Sensors (2 total) – 2 pin connectors
- Ignition/Injector odd number bank – 14 pin connector
- Ignition/Injector even number bank – 12 pin connector
- Crankshaft Position Sensor – 3 pin connector
- Accelerator Pedal Sensor – 6 pin connector
- Canister Purge Solenoid - 2 pin connector
- Ignition Switch Input (Wire) Wire
- Fuel Pump Control (Wire) Wire
- Engine Grounds (3 total) Eyelets
- Battery Power (Stud at Fuse/Relay Center)
- Cooling Fan Control Wire
- Vehicle Speed Sensor Connection – 2 pin

Optional Connections (Not required for operation)

- Engine Oil Pressure Sensor – 3 pin Connector
- Generator Control Connector – 2 pin
- Optional User Outputs Bulkhead – 12 pin Connector (12-way)
- MIL (Malfunction Indicator Lamp) wire

Connections

Connect all engine/vehicle-side connectors before connecting the harness to the ECM. All engine/vehicle-side connectors are functionally labeled, consult a service manual if necessary to determine connection locations.

Note: It may be easier to install the harness on the engine before installing the engine into the vehicle.

The harness includes a fuse/relay center containing all required fuses and relays, and also a 12-way bulkhead connector (with sealed mating connector) which contains outputs that may be useful to the user (see 'Bulkhead Connector Outputs' section below). The fuse/relay center should be mounted as high in the engine compartment as possible to avoid unnecessary splash and road debris. Likewise, keep the 12-way bulkhead connector and diagnostic link connector (both connect from the fuse/relay center) as high and protected as possible.

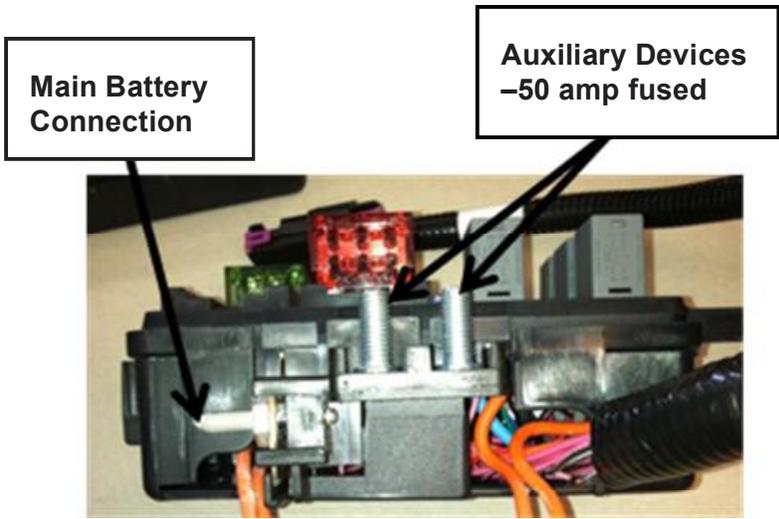
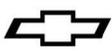
The 3 ECM connectors are indexed to connect only in the correct locations. Install by pressing down firmly until the connector is seated, then pull the top slider bar down until it snaps and locks into place. The bar should slide easily and will not move unless the connector is seated properly, do not use excessive force.

Attach the harness ground eyelets (3 total) to the engine block, ensuring the connections are clean and secure, and attach the fuel pump wire from the fuse/relay center to the power side of the pump (this feed is fused and relay-controlled from the ECM).

Make sure all intended engine and vehicle side connections have been made before proceeding to connect power.

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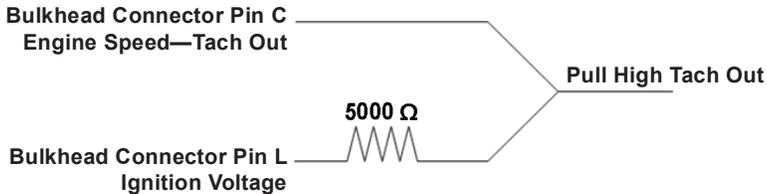


Attach a 12 volt ignition switch feed from the vehicle to the pink ignition switch wire in the harness (this is required to enable the proper power-up sequence of the ECM). This can be routed into the passenger compartment with the accelerator pedal connector and diagnostic link connector. Next, connect battery power (minimum 8 gauge wire) to the horizontal stud on the fuse relay center. The other two studs are for accessories and are 50 amp fused. The harness installation is complete.

Additional features and bulkhead connector descriptions are also included below:

System Features

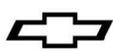
- The Fuse/Relay center contains all required fuses and relays for proper engine operation. Spare fuse and relay openings are provided for possible future customer use.
- The Fuse/Relay center includes a malfunction indicator light (MIL) which will illuminate in the event of an engine fault code. See your GM Performance Parts dealer to have this code retrieved at the diagnostic link connector in the fuse/relay center (using a Tech2 with GM Performance Parts Diagnostics selection. Codes can also be retrieved using an aftermarket diagnostic scan tool capable of reading this configuration. Note that the MIL will illuminate when the vehicle is keyed-up - this is normal, and it will go out once the engine is started if there are no current fault codes. A redundant MIL wire is included in the wiring harness to allow a light to mounted inside the passenger compartment. The wire is located in the wire bundle near the pedal connector and the ignition voltage.
- A cooling fan is controlled by the ECM. Control is set to turn on a 12 V fan at 97 Deg C (207 Deg F) coolant temperature. Once the fan comes on, the vehicle must exceed 15 mph before it will turn off. This prevents fan cycling at idle. The fan control wire is fused/ relayed and must be connected to your fan. **NOTE: If the relay is not in place it turn on the service engine soon light.**
- The fuel pump is controlled by the ECM. The control wire supplies 12 V and is fused/relayed and should connect to the 12 V side of the fuel pump.
- Most GM late model LS series alternators are supported using the connection included in the harness. Refer to service information for details.
- A tachometer signal is included in the bulkhead connector (see below). This is a 2 pulse/rev output which may correspond to a 4-cylinder setup in some tachometers or transmission controllers. Note the signal is a low voltage square wave, some tachometers or transmission controllers may need a pull-up resistor in order to read the signal, similar to a 5000 ohm, ¼ watt resistor– this detail is left to the user. The following circuit has worked for numerous devices – the resistor value may need to be changed if your device does not read this output properly.



NOTE: When connected to the CPP Supermatic Connect and Cruise Harness the pull up resistor is not required for the Transmission Controller.

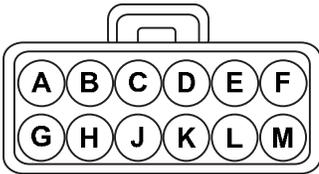
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- An oil pressure output is included in the bulkhead connector and can be used for a pressure gauge if desired (see Oil pressure Sensor below for scaling info). The oil pressure sensor is required for the system to operate properly. NOTE: Ensure that oil pressure sensor p/n 12616646 is installed for proper connection to the harness.
- A vehicle speed output is included in the bulkhead connector for use with auto-scaling speedometers. The vehicle speed sensor connector in the harness must be attached to a variable reluctance type speed sensor (typical of most late model GM automatic transmissions) for this to function.

Bulkhead Connector Outputs

Bulk Head Connector Pin L	Mating Connector
	15326849 Connector
	12191818 Female Terminal
	15366021 Seal
	15305171 Plug
	15430903 TPA
	15317832 CPA
	15326854 Connector
	15304701 Male Terminal
	15366021 Seal
	15305171 Plug
	15430903 TPA

Circuit #	Position	Wire Gage	Color	Description
2501A	A	22	Tan	GMLAN High Speed (-)
-	B	-	Plug	empty
121	C	22	White	Engine Speed
818	D	22	Brown	Vehicle Speed - Out
432B	E	22	Lt. Green	MAP Signal
-	F	-	Plug	empty
2500A	G	22	Tan/Black	GMLAN Low Speed (+)
331B	H	22	Tan/White	Oil Pressure Signal
486B	J	22	Purple	Throttle Pos #2 (0.5v - 4.5v)
40F	K	18	Orange	Battery Power Fuse
5292	L	18	Pink	Ignition "OnPower"
50B	M	18	Black	Ground

Bulkhead connector outputs - Terminals for the included mating connector can be acquired at a GM dealership in the Delphi Terminal Service kit. Terminals are Delphi part number 15326269 (GM part number 19167018), and wire seals are Delphi part number 15366021 (white seal).

These can be found in the Parts Department at many GM/Chevy dealerships.

- GMLAN Communication Link (TAN/BLACK STRIPE [+], TAN [-]) – This provides the GMLAN communication messages containing engine operating parameters for potential use in future add on modules – any current integration of this is left to the user. Can be used with a LAN dash or an electronic dash readout display.
- Tachometer Signal (WHITE) – This is a 2 pulse/rev output (see features above).
- Vehicle Speed (BROWN) – This is a non scaled output for use with auto-scaling speedometers and will not function unless a vehicle speed sensor (VSS) is connected to the ECM through the VSS wire in the harness.
- MAP (LT GREEN) – This is an output for use in gauges or for load indication in transmission controllers (any connection must be to high-impedance device). The output is a 0-5 volt signal ranging from 10 – 105 KPa (1.5 – 15.2 psia). Use the ground wire in the bulkhead connector as the low reference (ground).



- Oil pressure Sensor (TAN/WHITE STRIPE) – This is the output from the oil pressure sensor which can be used for monitoring (Pressure (psig) = [32 x Sensor Voltage]-16). Use the ground wire in the bulkhead connector as the low reference (ground).

PSI = (32* voltage) -16

Volts	PSI
0.5	0.0
1.0	16.0
2.0	48.0
3.0	80.0
4.0	112.0
5.0	144.0

- Throttle Position (PURPLE) - This is an output for use in gauges or for load indication in transmission controllers (any connection must be to a high-impedance device). The output is a 0.5 – 4.5 volt signal ranging from 0 – 100 %. Use the ground wire in the bulkhead connector as the low reference (ground).
- 10A Fused 12V Power (ORANGE) - This is a power output supply and is always enabled.
- 15A Fused 12V Ignition Power (PINK) – This is a power output supply and is enabled only when the ignition is on.
- Ground (BLACK) – This is used as the low reference (ground) for completion of the MAP, TPS, and oil pressure output circuits. It can also be used for modules connected to either of the fused 12V outputs.

Terminals for the included mating connector can be acquired at a GM/Chevy dealership in the Delphi Terminal Service kit (J38-125) in tray 8 position 9.

NOTE: If you are using CPP Supermatic Transmission Controller Kit # 19212657 the Tachometer Signal (WHITE) and Throttle Position (PURPLE) are required to be connected. If you are using CPP Supermatic Connect and Cruise kit #19257634 or 19257661 the bulk head connector must be plugged into the CPP Supermatic Connect and Cruise harness. For the Connect and Cruise the tachometer signal and the throttle position signal are received through the bulk head connector.

Install the Emissions Label

Install the emissions label in a visible location on the hood or on the front of dash.

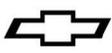
Start-up and Break-in Procedures

Safety first. If the vehicle is on the ground, be sure the emergency brake is set, the wheels are chocked and the car cannot fall into gear. Verify everything is installed properly and nothing was missed.

1. **Oil & Fluid Fill:** This engine assembly may need to be filled with oil or have oil added. After installing the engine, ensure the crankcase has been filled with the appropriate motor oil to the recommended oil fill level on the dipstick. The 6.2L LSA Crate Engine requires a special oil meeting GM Standard GM4718M (this will be specified on the oil label). Mobil 1 is one such recommended oil. Other oils meeting this standard may be identified as synthetic. However, not all synthetic oils will meet this GM standard. Look for and use only oil that meets GM Standard GM4718M. Also check and fill as required any other necessary fluids such as coolant, power steering fluid, etc.
2. **Oil System Prime:** a. The engine should be primed with oil before starting. Install an oil pressure gauge (the existing oil pressure sensor location at the upper rear of the engine may be used) and disconnect the engine control system (removing power from the engine control module is generally recommended). **Note:** Disconnecting only ignition or fuel injector connectors is not recommended – make sure the control system will not provide ignition or fuel to the engine. b. Once the engine control system has been disconnected, crank the engine using the starter for 10 seconds and check for oil pressure. If no pressure is indicated, wait 30 seconds and crank again for 10 seconds. Repeat this process until oil pressure is indicated on the gauge.
3. **Initial Engine Start:** Reconnect the engine control system. Start the engine and listen for any unusual noises. If no unusual noises are noted, run the engine at approximately 1000 RPM until normal operating temperature is reached.
4. **Engine Warm Up Recommendation:** When possible, you should always allow the engine to warm up prior to driving. It is a good practice to allow the oil sump and water temperature to reach 180°F (82°C) before towing heavy loads or performing hard acceleration runs.
5. **First 30 Mile Break-In Period:** The engine should be driven at varying loads and conditions for the first 30 miles or one hour without wide open throttle (WOT) or sustained high RPM accelerations.
6. **Medium Accelerations for Break-In:** Run five or six medium throttle (50%) accelerations to about 4000 RPM and back to idle (0% throttle) in gear.
7. **Hard Accelerations for Break-In:** Run two or three hard throttle (WOT 100%) accelerations to about 4000 RPM and back to idle (0% throttle) in gear.

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8. **Change the Oil and Filter:** Replace the oil per the specification in step 1, and replace the filter with a new PF48 AC Delco oil filter. Inspect the oil and the oil filter for any foreign particles to ensure that the engine is functioning properly.
9. **500 Mile Break-In Period:** Drive the next 500 miles (12 to 15 engine hours) under normal conditions. Do not run the engine at its maximum rated engine speed. Also, do not expose the engine to extended periods of high load.
10. **Change the Oil and Filter After 500 Mile Break-In:** Again, inspect the oil and oil filter for any foreign particles to ensure that the engine is functioning properly.

Emission Test Stations –

1. **Your vehicle must have Crankshaft Position System Variation Learn procedure** (sometimes called CASE Learn) done on it at a dealership before your Prep Drive Procedure (#2 Below) can be completed. Connected to these instruction is a coupon for a free Crankshaft Position System Variation Learn. Take it any GM Dealer to have the procedure done.
2. **Prep Drive Procedure:** This procedure is intended to help you set the I/M (Inspection and Maintenance) flags used by the emission test stations to determine emissions compliance. NOTE: It is suggested that you take these instructions with you to the inspection station. Caution: Be aware of road conditions and traffic at all times. This driven portion of this test is best done on expressway type roads where legal speeds are higher and during times where light traffic is present. It is recommended to have a passenger call out the instructions to allow the driver to remain focused on the road conditions and traffic. If the road conditions or traffic force you to abort the driving conditions laid out at any time, simply resume those conditions when the conditions allow.

NOTE: This must be done at an altitude below 6000 ft. Make sure that the MIL (Service engine soon light is out) – NO codes set. DISCONNECTING THE BATTERY OR CLEARING CODES AFTER PERFORMING THE DRIVE PROCEDURE WILL REQUIRE THIS PROCEDURE TO BE REPEATED.

Part 1 - Soak and Idle

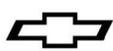
- 1- **Park the vehicle for 8 hours with battery connected.** The vehicle should NOT be parked in the direct sun light. Direct sun light may cause the I/M flag not to be set properly. The coolant/engine temperature must be below 113°F (45° C). NOTE: Turning the ignition on for any length of time to check the temperature may cause you to have to soak an additional 8 hours.
- 2- **Start the engine and idle for at least 3 minutes.**

Part 2 – On-The-Road Driving

- 1- Drive the vehicle with the accelerator between ¼ and ½ throttle for 5 minutes.
- 2- Drive at a steady speed with the engine speed between 1200 and 3000 RPM for 10 minutes.
- 3- Accelerate to 55 mph.
- 4- Shift to a lower gear, Second is preferred but choose a gear that will give you an engine RPM between 2500 and 4000 and not over speed the engine.
- 5- De-accelerate in that lower gear without using the brakes to 45 mph. Repeat steps 3 - 5 a minimum of four times. This is to activate “Decel Fuel Cut-Off”.
- 6- Put vehicle in drive and continue to drive normally for at least 5 more minutes.
- 7- Accelerate vehicle to 55 mph in a gear that will give you an engine speed of approximately 2500-3000 RPM.
- 8- De-accelerate in that gear without using the brakes to approximately 40 mph. Repeat steps 7 and 8 a minimum of 4 times.
- 9- Come to a stop and idle for 30 seconds (in gear for automatic trans).
- 10- Turn off engine and allow to sit for at least 30 seconds.
- 11- Restart engine and repeat steps 1 through 9.
- 12- That completes the Emission Test Station - Prep Drive Procedure.

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Service Information

Contact your GM Performance Parts Dealer for service or for instructions on how to obtain Service Manuals and Service Information. Use information from **GM Performance Parts Diagnostics** which can be selected from the first menu on the Tech2 for engine and harness diagnosis (use this information for all LSA crate engine systems).

Main Menu

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F0: Diagnostics
F1: Service Programming System
F2: View Captured Data
F3: GM Performance Parts Diagnostics
F4: Tool Options
F5: Getting Started
    
```

Appendix:

See www.chevyperformance.com for recommended starters, clutch and flywheels for the manual applications and accessory drive parts.

How the PVC System Works:

A closed crankcase ventilation system must be used in order to provide a more complete scavenging of crankcase vapors. Filtered air from the air induction system (air cleaner) duct is supplied to the crankcase, mixed with blow-by vapors, and passes through a crankcase ventilation metering device before entering the intake manifold. The primary component in the positive crankcase ventilation (PCV) system is the PCV flow metering orifice. Vacuum changes within the intake manifold result in flow variations of the blow-by vapors. If abnormal operating conditions occur, the design of the PCV system permits excessive amounts of blow-by vapors to back flow through the crankcase vent tube and into the engine induction system (air cleaner) to be consumed during normal combustion. This engine ventilation system design minimizes oil consumption and significantly reduces the potential for oil ingestion during vehicle limit handling maneuvers.

ECM Connectors Pinouts:

ECM

Blue
Item C1

34576-0703 Connector 33467-0003 Term (22 GA)

33467-0005 Term (18 GA) 34586-0001 Plug

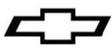
34575-003 Dress Cover

Circuit #	Position	Wire Gage	Color	
239M	10	22	Pink	Power
419	12	22	Brown/White	CEL Light
465	13	22	Green/White	Fuse Bus Pos 7A
239	19	18	Pink	Power
1440	20	22	Red/White	Fuse Bus Pos 6G
121	25	22	White	Engine Speed Bulk Head Pos C
1164	33	22	White/Black	Pedal Module Pos F
1374	35	22	Red	Pedal Module Pos C
1271	36	22	Brown	Pedal Module Pos D
1272	37	22	Purple	Pedal Module Pos A
818	39	22	Brown	Pin D Bulk Head
5069	40	22	Brown	Fuse Bus Pin 1A
7123	46	18	Brown	Supercharger Boost Press Signal
PDL 1	47	22	Blue	Pedal Module Pos E
PDL 2	49	22	Lt. Blue	Pedal Module Pos B
473	54	22	Blue	Fuse Bus 7D

All Other Positions to have Cavity Plugs

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ECM

Black
Item C2

- 34566-0103 Connector 33467-0003 Terminal (22 GA)
- 33467-0005 Terminal (18 GA) 7158-3113-40 Seal (1 each)
- 7116-4152-02 Term (1 each) 34586-0001 Plug (40 each)
- 34565-0003 Dress Cover

Circuit #	Position	Wire Gage	Color	
2121	1	20	Purple	Odd Coil Pin G
1664	2	22	Tan	Odd Fr O2 Sensor Pos A
1665	3	22	Purple/White	Odd Fr O2 Sensor Pos B
1668	4	20	Purple/White	Odd Rr O2 Sensor
1669	5	20	Tan/White	Odd Rr O2 Sensor
1876	6	22	Lt. Blue	Even Knock Pos A
407	7	22	Tan	Even Knock Pos B
496	8	22	Blue	Odd Knock Pos A
1716	9	22	Gray	Odd Knock Pos B
581	11	22	Yellow	ETC Pos B
582	12	22	Brown	ETC Pos A
5290	13	18	Pink/Black	Pos 1B Bulk Head
1746	16	20	Lt. Blue/Black	Injector 3 Pos B
2128	17	20	Purple/White	Even Coils Pos G
2124	18	20	Green/White	Even Coils Pos C
2130	19	18	Brown/White	Even Coils Pos E
632	23	22	Pink/Black	Cam Sensor Ground Pos B
2755	24	22	Black	Oil Pressure Sensor Rtn Pos A
7125	25	18	Green	Supercharger Pressure Sensor Grnd
1868	27	22	Yellow/Black	Crank Sensor Ground Pos B
1704	28	22	Pink/Black	Fuse Cavity 8J
1704A	29	22	Red/White	ETC Pos C
1745	32	20	Lt. Green/Black	Injector 2 Pin B
2127	33	20	Orange	Odd Coil Pos B
2127A	34	20	Green	Odd Coil Pos C
2129	35	22	Brown	Odd Coil Pos E
631	39	22	Orange	Cam Sensor Power Pos A
2705	40	22	Gray	Oil Pressure Sensor 5V Ref Pos B
552	42	22	Tan	MAF Pos D
1867	43	22	Lt. Green	Crank Sensor Signal Pos C
1688	44	22	Lt. Blue/Black	ETC Pos E
878	48	22	Blue/White	Injector 8 Pin B
847	49	22	Tan/White	Injector 5 Pin B
846	52	22	Yellow/Black	Injector 6 Pin B
2122	53	22	Red/White	Even Coils Pos B
2126	54	22	Lt. Blue/White	Even Coils Pos F
2123	55	22	Lt. Blue	Odd Coils pin F
633	59	22	Brown/White	Cam Sensor Signal Pos C
331A	60	22	Tan/White	Oil Pressure Sensor Signal Pos C
472	62	22	Tan	MAF Pos E
1869	63	22	Blue/White	Crank Sensor Power Pos A

TITLE **LSA E-Rod Crate Engine Control System**

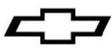
IR 28JN12

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Circuit #	Position	Wire Gage	Color
485	64	22	Green
486	66	22	Purple
492	67	22	Yellow
3113	68	22	Gray/White
3122	69	20	Gray/White
844	70	20	Lt. Blue/Black
877	71	20	Orange/Black
1744	72	20	Tan
750	73	14	Black

ETC Throttle Pos. Sensor #1 Pos D
ETC Throttle Pos. Sensor #2 Pos F
MAF Pos A
Odd Fr O2 Heater Pos E
Odd Rear O2 Heater
Injector 4 pin b
Injector 7 pin B
Injector 1 pin B
Ground

All Other Positions to have Cavity Plugs

ECM

Gray Item C3

- 34566-0203 Connector
- 33467-0003 Terminal (22 GA)
- 7158-3113-40 Seal (1 each)
- 7116-4152-02 Term (1 each)
- 34586-0001 Plug (40 each)
- 34565-0003 Dress Cover

Circuit #	Position	Wire Gage	Color
1667	3	22	Tan
1666	4	22	Purple
1670	5	20	Purple
1671	6	20	Tan
225	7	22	Orange
1724	14	22	Gray
3212	15	22	Lt. Green
2014	16	22	Pink
6014	22	20	Orange/Black
469	23	22	Orange/Black
2501	33	22	Tan
2761	35	22	Tan
6120	36	22	Yellow/Black
2932	38	22	White/Black
2704	39	22	Gray
3607	42	22	Lt. Blue/White
428	48	20	Green/White
335	49	22	Green
3223	50	22	Tan/Black
2500	53	22	Tan/Black
410	55	22	Yellow
6118	56	22	Lt. Blue
433	58	20	Gray/Black
432	59	22	Lt. Green
821	66	22	Purple/White
822	67	22	Lt. Green/Black
750A	73	14	Black

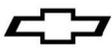
Even Fr O2 Pos A
Even Fr O2 Pos B
Even Rr O2
Even Rr O2
Generator Pos B
Scharger Waste Gate pin 2
Even Fr O2 Pos E
Intercooler Pump Power
Baro Press Ground
MAP Pos A
ALDL Pin 14, Bulkhead pin G
ECT Pos 1
Inlet Air Temp Grnd pin b
Baro Pressure Sens Power
MAP Pos C
Intercooler Pump Signal
Canister Purge pin b
Fuse Bus Pos 7D
Even Rr O2 Sens Heater
ALDL Pin 6, Bulkhead pin A
Engine Coolant Sensor Pos 2
Inlet Air Temp signal pin a
Baro Sensor pin c
MAP Pos B
VSS TOSS Hi Pos 2
VSS TOSS Lo Pos 1
Ground

All Other Positions to have Cavity Plugs

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Coupon for Crankshaft Position System Variation Learn Procedure



	Part Number: 19256487	Date: 01-2010
	Serial Number: ELS3M0001	Displacement: 6.2L

NOTE: When your vehicle is completed, write your engine serial number in the area indicated on the coupon below (see the above picture for the location of the serial number) and take the coupon and vehicle to your GM Dealer.

**Good for one free Crankshaft Position System Variation Learn Procedure
at any GM Dealer for your E-Rod Engine**

Write Engine Serial Number Here

Note to Dealers: This coupon is good for one free Crankshaft Position System Variation Learn procedure found in the service information Document ID: 2348341. Charge this procedure to Z2271 and enter the E-ROD engine serial number in the claim notes to guarantee payment.