

**HOWELL**  
ENGINE DEVELOPMENTS, INC.  
FUEL INJECTION APPLICATIONS

**INSTALLATION  
MANUAL**

**Vortec Truck  
V-6/V-8  
Fuel Injection Harness**

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INSTALLATION INSTRUCTIONS  
FOR  
VORTEC TRUCK V-8/V-6 FUEL INJECTION HARNESS

You have just acquired one of our premier electronic fuel injection wiring harnesses, enabling you to easily install and wire up any 1996-2000 Vortec 4.3L V-6 or V-8 small block or big block Chevrolet engine. It is designed to utilize the original factory vehicle on-board computer (ECM) and all the GM preferred relays, sensors and other accessories to operate the fuel injection and ignition as originally designed by the factory. All systems that effect engine performance have been included and emission control connectors are in place. Electronic automatic transmission wiring is included if specified in your order.

Vortec engine designs vary somewhat between V-6, small block and 454 big block, primarily in component location and injector design. V-6 & V-8 small blocks are sequential central port design and big blocks are sequential, but use individual port injectors. The sequential feature means that the injectors fire in the same sequence as the spark plugs giving a somewhat smoother idle and better fuel economy and exhaust emissions. Previous TBI and tuned port EFI engines fired all injectors either once per engine revolution or once every 2 revolutions.

These instructions assume you are installing an engine salvaged from a late model wreck or otherwise damaged vehicle into an older or non-computerized vehicle such as a truck or Jeep. Because these transplants run with the stock Vortec ECM, they require use of a working vehicle speed sensor (VSS) AND ALL THE oxygen sensors used in the factory installation (usually 4). The more of these parts you can salvage with the engine the less you have to buy new to get it up and running. Be sure to get the Mass Air Flow (MAF) sensor mounted in the air intake duct and if possible get the factory air cleaner or a similar one with the engine. When mating the Vortec engine up to a 4-wheel drive transfer case you will have to supply a (VSS) signal from the transfer case. Howell Engine Developments, Inc. has these speed sensors if you need one.

INSTALLATION

All Vortec ECM's are weatherproof and can be mounted underhood if desired. If you intend to mount the ECM inside the vehicle you will need a hole in the firewall large enough to pass through the largest engine connector along with the harness, threading it through from the passenger side of the firewall.

Mount the ECM, fuse block, ALDL connector and check engine light on the passenger side of the firewall or dashboard. Make or buy a protective grommet to protect and seal the harness where it passes through the firewall.

In the engine compartment you will need to mount the fuel pump relay, AC relay and battery power fuse on the firewall or fenderwell. All other sensors are engine mounted. Vortec engines run 4 exhaust system mounted heated oxygen sensors, two on each side and they control each bank separately when operating in closed loop. The front two sensors have flat 4 pin connectors and the rears are square 4 pin connectors and all must be functional for the ECM to work properly. (Oxy sensors are a 14 mm thread and Howell can supply 14 mm nipples to weld into your exhaust system if required.)

Connect the large ground terminals to the back of the RH cylinder head and connect all other sensor, distributor and injector wires as labeled.

Connect a 14-gauge wire directly from the battery positive terminal, (or other major fulltime 12V source), to the battery feed terminal on the harness. A Weatherpack male terminal and female connector are supplied to connect this line to the harness. This

Connect a 14 or 16-gauge wire from the harness to your electric fuel pump. A Weatherpack connector is also supplied for this. This power feed from the harness is color coded RED and comes out of the fuel pump relay (labeled Fuel Pump Power).

Connect a 14 or 16-gauge wire from your ignition switch to the PINK power lead at the 3-fuse block close to the ECM. This supplies switched 12-volt power to the harness to run the ECM, Ignition, Injectors and other powered sensors. **THIS 12 VOLT LEAD MUST HAVE POWER DURING THE TIME THE ENGINE IS CRANKING AND RUNNING**, so be careful where you tie into the vehicle power system to make sure that it does. This power feed must turn off when the ignition switch is off. The ECM and injectors are protected by 4-fuses in a single fuse block. A Weatherpack connector is also supplied for this connection.

If you do not intend to use a light bulb already in your dashboard you will need to purchase a suitable 12V bulb and socket for a "Check Engine" light. This will be connected permanently to the wires marked as such near the ECM connectors.

The "Check Engine" or "Service Engine Soon" light should be mounted where it is visible to the driver. It will come on whenever the ignition is turned on and **STAY OH WHILE CRANKING THE ENGINE**. It should go off when the engine starts. If it comes back on in a short time, it means one of the sensors or systems is malfunctioning and the ECM has stored a diagnostic trouble code (DTC) to tell you there is some malfunction. Late model GM ECM's monitor so many functions, it is not practical for Howell Engine Developments, Inc. to try to publish a do-it-yourself trouble-shooting guide for them. If you need a malfunction diagnosed any Chevrolet or good tune up mechanic with a truck service manual and a diagnostic scanner should be able to trouble-shoot it for you. Most, but not all, of the original wire color codes have been retained in this harness.

**FUEL PUMP** – Whatever electric fuel pump you use needs to supply 60-65 PSI of filtered fuel at the fuel rail and maintain that pressure from idle to high speed wide open throttle. CPI V-6 and V-8 engines run at 60-66 PSI and 454 sequential engines run at 56-62 PSI fuel pressure. The operating fuel pressure is regulated at the engine and a return line from the fuel rail takes excess, or bypass, fuel back to the vehicle tank. Your fuel pump should be mounted under the floor near the fuel tank or inside the fuel tank. Connected to harness power, the fuel pump will operate for 2 or 3 seconds when the ignition is turned on. It will resume operating when you start to crank the engine and continue running when the engine starts.

There are several sources for high-pressure fuel pumps. Late model trucks use excellent in-tank pumps made by AC products. We stock and sell Air-Tex in-line fuel pumps with hose nipple ends and Bosch sells in-line pumps for most foreign and some domestic EFI vehicles. Rubber isolates the pump with mounts and flexible fuel lines or it will be noisy. A fuel pump that will supply 65 PSI or more is required as noted above.

**IGNITION SYSTEM** – Power for your ignition system on the Vortec engine is supplied from the harness. Many times you can use the engine wiring harness originally installed in your vehicle to power up PINK wire on the harness fuse block. **MAKE SURE YOUR IGNITION SUPPLY WIRE IS 12 VOLTS AND NOT A LOWER VOLTAGE AS USED IN EARLIER BREAKER POINT IGNITION SYSTEMS.**

**AIR CLEANER** – All Vortec engines use a Mass Airflow Sensor (MAF) in the inlet system. Depending on your installation or what you salvaged from the scrap yard with your engine, you may run the original vehicle air cleaner or a cleaner of your choice, but it must incorporate the MAF. Always operate your engine with a duct or air filter

attached to the open end of a MAF sensor. Airflow blowing across the open end will seriously affect engine operation. Do not locate a MAF more than 24 inches from the throttle body or it may adversely affect throttle response.

**OXYGEN SENSORS** – Proper operation of GM Vortec engines requires the factory or similar replacement heated oxygen sensors and unleaded fuel. The GM ECM's are "smart" computers and will improve their driving calibration while operating in "closed loop" and retain it as long as the battery power remains connected. Normally the engine will go "closed loop" after the primary oxygen sensors reach 600 degrees F. Whenever the battery power feed is disconnected the ECM will lose its stored memory and may not drive as well for a while until driving restores the learned calibration. The 4 oxygen sensors used in the Vortec system are factory installed, two near the engine and two after the catalytic converter(s). Our experience has been that the systems operate OK with the 4 sensors even if no catalytic converters are present, which they may not be on an older vehicle. **NOTE:** In the rare case that Oxygen sensors get reversed side to side, they will drive OK with a clean memory ECM until they go into closed loop. In closed loop, they will get confused signals and start to run terrible. If you have these symptoms, look for reversed oxygen sensor leads.

**START UP AND INITIAL DRIVING** – With all the previously discussed connections made and 60 PSI (approx) of fuel pressure, your vehicle should start right up and smooth out as soon as the air is purged from the injector nozzles. Check for fuel leaks and make sure none of your wiring or fuel lines are in a position where the exhaust system heat can damage them. **MAKE SURE THE COOLING SYSTEM IS FULL.** If the engine does not start immediately, it may be because the fuel pump cannot displace air in the line and prime itself. Loosen the high-pressure line at the engine and cycle the pump by turning on the ignition engine compartment. Look at your "SERVICE ENGINE SOON" light when attempting to start for the first time. The light should come on when the ignition is turned on, **STAY ON** during cranking and go off when the engine starts. **IF THE LIGHT GOES OFF DURING CRANKING, IT MEANS YOU HAVE POWERED THE ECM AND INJECTORS FROM AN ACCESSORY FUSE BLOCK TERMINAL AND THE ENGINE WILL NOT START.** Your switched 12V power must come from a terminal that is hot with key on, during cranking and goes off when the ignition is turned off.

**VEHICLE ANTI-THEFT SYSTEM** – Starting in 1998 most Vortec powered vehicles were built incorporating a resistor key VATS system. This is programmed into the ECM of every vehicle built with VATS. If the engine you intend to use came from a vehicle with the VATS system, you will have to use an ECM from a similar 1996 or 1997 model engine or vehicle. Howell is currently working to develop a VATS de-coder that can be incorporated into later model harnesses, but it is not yet available.

Because our wiring harnesses keep all essential engine functions operating, they qualify as direct factory replacements for emission function in the eyes of the EPA and CARB. Contact us if you need additional help with your installation.

For older vehicles (without brake interrupt TCC wiring) we can supply lock-up kits using a vacuum switch and 4<sup>th</sup> gear pressure switch to work on all transmissions with lock-up converters (THM 350's, 200R4's and 700R4's). We can also supply the required Vehicle Speed Sensor (for cable driven speedometer outlets) for the Vortec installation with Manual transmission or non-electronic automatics.