

HOWELL
ENGINE DEVELOPMENTS, INC.
FUEL INJECTION APPLICATIONS

**INSTALLATION
MANUAL**

**Throttle Body
Fuel Injection Harness**

Howell Engine Developments, Inc.
6201 Industrial Way
Marine City, MI 48039
Phone: 810-765-5100
Fax: 810-765-1503

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INSTALLATION INSTRUCTIONS THROTTLE BODY FUEL INJECTION HARNESS

You have just acquired one of our basic electronic fuel injection wiring harnesses, enabling you to easily install and wire up any 1986-1995 Throttle Body Injected (TBI) small block Chevrolet, V-8 or V-6 (4.3L) engine. It is designed to utilize the 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 affect engine performance have been included and emission control connectors (except canister purge) are in place for street legal operation. (Many older and off-road vehicles do not require emission connectors.)

Our harnesses are designed to operate with 1986 and later Electronic Control Modules (ECM's) as used in passenger cars, vans and full sized pickups that were originally equipped with 2-barrel throttle body fuel injection. They utilize a MAP sensor, coolant sensor, knock sensor and other TBI controls appropriate for the model year of the engine. They supply the complete wiring necessary to operate the engine fuel system and spark control as originally designed. In 1991 GM changed the throttle position sensor connector and some 1991 and later model engines will use a different style ECM, some with the ability to manage an electronically controlled transmission. There are also several styles of EGR solenoid connectors. In the event your harness does not have the connectors to match your engine and ECM, please let us know and we will exchange it or supply adaptor connectors.

TBI units are sized by the manufacturer specifically for each different engine they are offered on. This is usually accomplished by installing injector nozzles of varying flow rates to match the displacement or airflow of the engine. Along with the specific TBI injector unit there is a matched ECM calibration for fuel and spark advance to go with each engine. Because of this you cannot mix and match parts that look alike to get a proper functioning system. They must be matched by part number. All TBI systems we service are equipped with the correct matching ECM's and calibrations. Also, because of these unique calibrations, you cannot significantly alter your engine to increase the airflow or power without running into drivability and fuel economy problems. In the event you have a nonstick engine combination contact Howell Engine Developments. Many times we can supply a custom calibration prom to match your engine.

The basic parts to run a complete TBI system are:

1. ECM (vehicle computer) with Prom and Calpak installed, appropriate for your model and type of engine. (Some later model ECM's use a Mem-cal unit, which integrates cal-prom, calpak and electronic spark control.)
2. Wiring Harness.
3. Distributor (remote coil type with fixed rotor).
4. Throttle body injector unit (to match your engine size).
5. Inlet manifold for TBI (better than adapting a 4-barrel manifold).
6. Coolant sensor (threads into the intake manifold near thermostat).
7. ESC module (controls spark timing in case of spark knock). 1986-1992 models.
8. MAP sensor (reads manifold vacuum continuously).
9. EGR Solenoid and EGR valve (to be emission legal).

10. Oxygen Sensor (threads into exhaust pipe or manifold).
11. Knock sensor (threads into block drain).
12. High Pressure fuel pump (system requires 12-15 PSI fuel pressure).
13. Air cleaner to fit.

Any salvaged engine from a late model wreck should have all or most of the above parts. They can also be purchased separately and installed on any stock Chevy engine with good results. Any parts missing can be ordered from a GM dealer or a Howell Engine Developments parts list.

Howell harnesses are equipped with labels for all connectors, relays, sensors, etc. They are laid out to fit most common engine arrangements.

When possible, engines should be installed with conventional exhaust manifolds and air cleaner, retaining the exhaust heat to the air cleaner from the exhaust manifold. This is important to prevent throttle icing at low ambient temperatures, just as it was in the original vehicle. In some factory installations the heater water passes through the intake manifold to warm up the injector body and prevent icing.

INSTALLATION

To mount the ECM inside the vehicle, you will need a hold 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 fuel pump relays, battery and fuel pump power fuses on the firewall or fenderwells. All other sensors are engine mounted. If you have exhaust manifold clearance problems you may need to relocate the knock sensor from the right block drain to the threaded hole above the oil filter pad on the left hand side. (Re-tap the hole to 1/4" pipe thread.) You also need to mount the Oxygen sensor in the left hand exhaust manifold or pipe below the manifold.

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 battery power feed is color coded ORANGE and is protected by its own 20 Amp fuse and weather proof fuse block.

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 RD and also has its own weatherproof fuse block and 15 Amp fuse.

Connect a 14 or 16 gauge wire from your ignition switch to the PINK power lead at the triple fuse block close to the ECM. This supplies switched 12-volt power to the harness to run the ECM, 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 three 5 Amp fuses. 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 ON 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 "trouble code" to tell you where to look. Our TBI service manual sent with your harness will help you diagnose and correct trouble codes. If not, any Chevrolet or good tune up mechanic with a pickup truck service manual should be able to trouble shoot it for you. Most, but not all, of the original wire color codes have been retained in the harness.

FUEL PUMP INSTRUCTIONS – Whatever electric fuel pump you use needs to supply filtered 15 PSI fuel at the left hand fuel fitting of the TBI unit and maintain that pressure from idle to high speed wide open throttle. 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 few sources for in-line high-pressure fuel pumps. The factory in-tank fuel pumps work the best, but may be difficult to adapt to your vehicle tank. We stock and sell Walbro in-line fuel pumps with hose nipple ends (the high pressure or fuel out end is the one with the electrical connectors). Rubber isolates the pump with mounts and flexible fuel lines or it may be noisy. A fuel pump that will supply 15 PSI or more is required. The fuel pressure is regulated in the TBI unit to approximately 12 PSI.

IGNITION SYSTEM – You will need a 12 or 14-gauge ignition wire to the positive terminal on the distributor cap or coil. This should come from your ignition switch and should be protected by a separate fuse for safety. Many times you can use the engine wiring harness originally installed in your vehicle to power up the ignition and other standard sensors and gauges on your TBI engine. **MAKE SURE YOUR IGNITION SUPPLY WIRE IS 12 VOLTS AND NOT A LOWER VOLTAGE AS USED IN EARLIER BREAKER POINT IGNITION SYSTEMS.** GM remote coil ignitions require a special gray molded connector to connect to ignition power. Howell can supply one of these if you do not have one.

OXYGEN SENSOR – Proper operation of GM fuel injected engines requires an oxygen sensor 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 oxygen sensor reaches 600 degrees F. Header equipped vehicles should be equipped with heated oxygen sensors due to the cooler operation of the sensor located further from the engine and the heat rejection of the header tubes. Howell can supply these if needed. Whenever the battery power feed is disconnected the ECM will lose its stored memory and may not drive as well for a while until the learned calibration is restored to the ECM

by driving. Our service manual tells you how to use the computer diagnostic system to find out when and if your engine is going into closed loop operation.

START UP AND INITIAL DRIVING – With all the previously discussed connections made and 12 PSI 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 altered 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 TBI unit and cycle the pump by turning on the ignition key to displace the air. Wrap a rag around the fitting to prevent gas from spraying around the 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.

On ECM controlled spark timing systems, set the initial spark timing to the factory recommended or your desired setting with the “EST Disconnect” unplugged. Reconnect this plug after setting the initial timing. **NOTE:** Running with the EST disconnect uncoupled will turn on the SES light and store a code 42 in the ECM memory. You may want to disconnect the battery power for 30 seconds to clear this code after setting the timing. If you have other difficulties our service manual will help you troubleshoot them.

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. There are however a number of non-engine components that are required for emission compliance in different vehicles and in different states. These include catalytic converters, air pumps and AIR plumbing. In California, you may have to present your EFI vehicle to a referee to determine its emission compliance and legality to license. Contact us if you need additional help with your installation or a vehicle speed sensor as required in CA. A vehicle speed sensor also needs a functioning “Park/Neutral” switch to operate properly.

For older vehicles (without vehicle speed sensors and brake interrupt TCC wiring) we can supply lock-up kits using a vacuum switch and 4th gear pressure switch to work on all transmissions with lock-up converters (THM 350's, 200R4's and 700R4's). Harnesses specified for use with later model engines and electronic transmissions can be ordered with all the correct wiring to operate the transmission and lock-up converters.

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