INSTALLATION INSTRUCTIONS
TUNED PORT FUEL INJECTION HARNESS
A Product of
HOWELL ENGINE DEVELOPMENTS
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You have just acquired the latest in Electronic Fuel Injection harnesses, allowing installation of any 1985 or later Tuned Port Fuel Injection and intake manifold on a Chevrolet small block V-8 engine. It is designed utilize the vehicle on-board computer, and all the GM preferred relays, sensors and other accessories to operate the fuel injection as originally designed. All systems that effect engine performance have been included except for those that are exclusively for emission control such as the Air Injection Reactor and Exhaust Gas Recirculation system. (Emission connectors available on special orders.)

Our harnesses are designed to operate Tuned Port Engines from model years, 1985 to the present. 1985-89 models can be run with Mass Air Flow Sensors (production design) or with the 1990-92, Speed Density electronics. MAF designs require the correct harness and ECM #1227165. Speed density designs require a different harness and ECM #1227730. Eliminating the MAF with 90-92 electronics allows you to install your air filter directly on the throttle body opening, and gives a tidier underhood appearance. A modified engine should not be set up with 90-92 electronics unless you are sure you can get a calibration prom (Mem-Cal) to match it.

LT-1 engines were introduced in 1992 in Corvettes and 93 in Camaro and Firebirds. The engines are identical except for exhaust manifolds and arrangement of accessories at the front of the engine. Because of this, Corvette and Camaro/Firebird engines require different harness designs. Howell harnesses operate both engine designs with a Camaro No-VATS memcal (using one knock sensor only). Both vehicles use PN 16159278 ECM. All 1994 LT-l's use a new design MAF sensor and new underhood ECM that is programmable only by the factory. Until more information is available, they can only be transplanted to other vehicles using 93 electronics.

Tuned Port Injection units that werc originally marketed for use on 350 CID engines must use an ECM calibrator prom (Mem-Cal) matching that size of engine. TPI units marketed for 305 CID engines must use a calibration prom matching that model engine. This is due to the fact that GM used different sized injectors in the 350 and 305 engines. Any model year intake manifold and injection unit may be used. Distributors with integral or remote coil are suitable. On 85 to 89 systems, because the Mass Air Flow sensor measures the actual flow of air into the engine at all times, each TPI (305 or 350) will cover a range of engine sizes satisfactorily. Typically, 305 injectors will handle engines from 283 to 350 CID, and 350 injectors will handle engines from 327 to 400 CID. Highly modified engines with modified TPI manifolds that make more that 365 BHP may require larger injectors. If you are in this category, contact us and we will refer you to a supplier.

INSTALLATION
You will need a hole in the firewall large enough to pass 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 as you choose. Make or buy a protective grommet to protect and seal the harness where it passes through the firewall.

TPI Harness Instructions

In the engine compartment, you will need to mount the mass air sensor, fuel pump relays, and ESC module in convenient locations on the firewall or fenderwells. All other sensors are on the engine. You can mount the individual, sealed, fuse blocks for the battery power and fuel pump power to solid mounts if you wish. LT-1 ECM's can be mounted in the engine compartments if desired.

For street rods, our harnesses are designed to mount all fuse blocks, relays, and ESC module (if used) on the inside of firewall with the ECM. Also on street rods, you may have to move the knock sensor from the RH block drain to the threaded hole above the oil filter pad on the LH side, because of header interference. (Re-tap the hole 1/4 pipe.) You will also need to mount the Oxygen sensor in the LH collector or pipe below the collector.

Connect the small ring terminal, on wire that parallels the knock sensor wire, to a terminal on the starter solenoid that has 12 volts only when the engine is cranking. This activates the cold-start injector while cranking. (Not used on 89 and later engines, either MAF or Speed Density.

Connect the large ground terminals, to the back of the RH cyl head.

Connect all other sensor and injector lines as labeled.

Connect a 14 gauge wire directly from the battery positive terminal (or other major full-time 12-Volt connector) to the battery feed terminal on the harness. A Weather-Pack male terminal and female connector is 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 gauge wire from the harness to your electric fuel pump. A weather-pack connector is supplied for this. This power feed from the harness is color coded red and also has its own weather proof fuse block and 15 Amp fuse.

Connect a 14 or 16 gauge wire from your ignition switch to the power lead at the 3 fuse block close to the ECM. 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. Power for the ECM and injectors comes from this connection, and they are protected by three 5 Amp fuses. A Weather-Pack connector is also supplied for this power lead. (On street rod harnesses a single fuse block with 4 fuses is mounted near the ECM on the firewall, to handle battery, switched, and Fuel Pump power.)

If you do not intend to use a light bulb already in your dash board, you will need to purchase (at Radio Shack, or an automotive parts store) 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 85 page- Service Manual will help you diagnose and correct troubles. If not, any Chevrolet mechanic with a Camaro service manual should be able to trouble-shoot it for you. Most, but not all, of the original GM wire color codes have been retained in this harness.

TPI Harness Instructions

Your electric fuel pump should supply more than 45 PSI fuel pressure, through a large filter, to the fuel rail. 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 the harness power feed, the fuel pump will operate for 2 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. The Corvette, Camaro, and Trans-Am use an excellent in-the-tank pump made by AC Products. They can be obtained from your Chevy dealer. We carry high pressure Bosch in-line fuel pumps in stock at all times, as well as a high volume in-line fuel filter to compliment your system. Many fuel injected foreign cars also use a Bosch pump. Rubber isolate the pump through mounts and flexible fuel lines, or it will be noisy. A fuel pump that will pump 50 PSI or more is required. The fuel pressure is regulated in the intake manifold fuel rails to approx 45 PSI.

You will need a 12 or 14 gauge ignition wire to the "Batt" terminal on the distributor cap (or the coil on systems with a remote coil distributor). This should come from your ignition switch, and should be protected by a separate vehicle 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 TPI engine. GM Remote TPI Coils require a special grey molded connector to connect ignition power. If you do not have one from a production TPI harness, they are available from Howell Engine Developments.

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. If necessary, put a right angle duct in front of the throttle body and install the air flow sensor perpendicular to the engine. Always operate your engine with a duct or air filter attached to the open end of the MAF sensor. Air flow blowing across the open end will seriously affect engine operation. Do not locate the Mass Air Flow Sensor more than 12 to 14 inches from the throttle body. or it will adversely affect the TPI calibration. K&N makes a filter that will clamp directly on the MAF Sensor or 3 1/4" duct. We have been successful using 3" Schedule 30 PVC plumbing pipe for inlet air ducts.

If you run a 1990 or later electronic system, you can mount your air filter directly on the throttle body opening. K&N makes a large oval tapered filter that clamps directly onto the throttle body. We carry both Air Filters in stock at all times.

Proper operation of GM TPI systems require an oxygen sensor and unleaded fuel. The GM ECM is a "smart" computer, and as long as the battery feed remains connected, it will improve its driving calibration while operating "closed loop," and retain it. Normally the engine will go closed loop after the oxygen sensor reaches 600 degrees F. Whenever the battery power feed is disconnected, the computer will lose its memory, and your vehicle will not drive as well for a while untfl the learned calibration is restored by driving. Our service manual tells you how to use the computer diagnostic system to find out if your engine is going into closed loop operation.

TPI Harness Instruction

      With all of the above connections made, and 45 PSI of fuel pressure, your vehicle should start right up, and smooth out as soon as the air is purged out of the injector nozzles. In case it doesn't, our service manual will help you trouble-shoot it. In case you get an immediate Code 46 on your check engine light, it means you have a Corvette or other VATS protected calibration prom. Code 46 is the Vehicle Anti-theft system and you must have a Cal-prom that does not have the anti-theft feature. On 1986-88 systems you can substitute an IROC Camaro mem-cal. For 1989 or later systems you <u>must</u> run a 1989 or later mem-cal that has been reprogrammed to eliminate VATS. We keep in stock, No-VATS mem-cals for all models including LT-l's.

      Because our wiring harnesses keep all essential engine functions operating, they qualify as direct factory replacements for emission purposes in the eyes of the EPA and CARB. If you are doing an installation requiring emission controls we have instructions and special add-on emission harnesses and vehicle speed sensors that meet 49 state EPA standards as well as the rigorous California requirements. Contact us if you need additional help with your installation.

      Only our Monte Carlo/El Camino MAF harness is designed to operate automatic transmission lock-up converters, and integrate with the under dash JP connector. We recommend using a vacuum switch and separate wiring for lock-up converters in older vehicles (without vehicle speed sensors and brake light wiring). We can supply a lock-up kit including switch, schematic, and connectors if you desire. Our kit will work on all trans with lock-up converters (THM 350's, 200 R4's,and 700 R4's)

                                    Enjoy,

                                      Bill Howell

IF YOU HAVE ANY PROBLEMS---GIVE US A CALL ON 810-765-5100