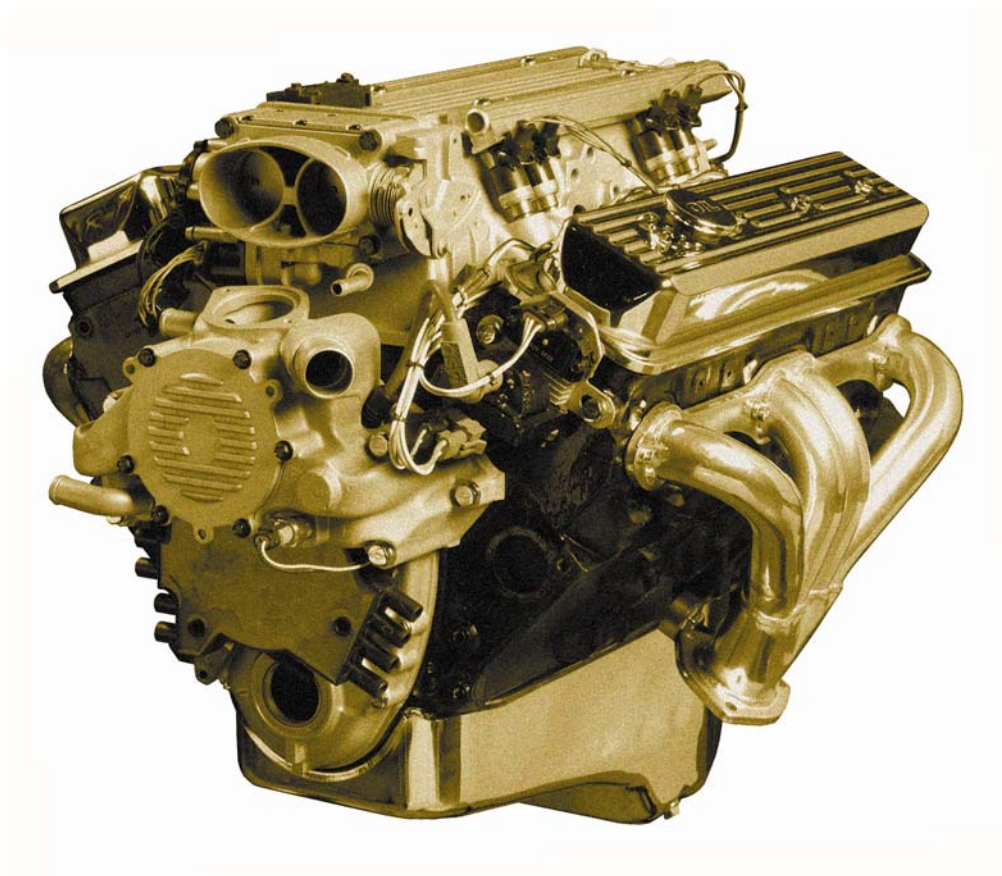




**Wire Harness Installation Instructions  
For Installing:**

**Part # 65105 – Into 1992-1997 (5.7L) LT-1 Engines**

**Part # 65205 – Into 1992-1997 (5.7L) LT-1 Engines**



**Manual # 90537**

**Perfect Performance Products, LLC**  
**Painless Performance Products Division**  
**2501 Ludelle Street Fort Worth, Texas 76105-1036**  
**(800) 423-9696**

We have attempted to provide you with as accurate instructions as possible, and are always concerned about corrections or improvements that can be made. If you have found any errors or omissions, or if you simply have comments or suggestions concerning these instructions, please write us at the address on the cover and let us know. Or, better yet, send us a fax at (817) 244-4024

For Technical Questions

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Tech Line: (800) 423-9696

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P/N 90537 Painless Performance Products Manual  
Oct. 2008 Fourth Edition

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# PLEASE READ ALL INSTRUCTIONS PRIOR TO INSTALL

## 1.0 Introduction

You have purchased what we at Painless Performance believe to be the most up-to-date and easiest -to-install automotive engine management system on the market. It is designed for easy installation, even if you have no electrical experience.

This harness is designed to be a complete wiring system for the computer and fuel injection system on General Motors LT-1 engines. This kit includes all wiring that is needed by the computer to run and control the fuel injection system. It is designed to use the part listed in **Table 4.1**. Using any other parts could cause the system to function improperly.

The system will work on LT-1 engines from 1992-1997 models. When using this harness on 1992-1993 LT-1 engines please call the Painless tech hot line and request a WH-399 distributor pigtail. When using this harness on a 1996 or 1997 engine, you must replace the Coil, Coil Output Wire and Knock Sensor with the parts from a 1992 thru 1995 engine. Painless Performance part number 60126 has the proper parts for this change. This harness will not have any of the wiring for the 700R4, 4L60 or 4L60E / 4L80E electronic transmissions. If you are running a 700R4 transmission and would like to have the lock-up functions you can purchase Painless Performance part number 60109. If you are running an electronic transmission you will need to contact an aftermarket transmission supplier for that harness and computer.

**Note: This harness does not have wiring for emission devices.**

**Note: When installing the 65105 we recommend that you start from the back of the engine and work your way forward.**

**Note: This system has been designed to run on the batch fire system. See note on page 22 for information.**

Usually, the computer and dash group can easily be mounted under the dash. Most of the wiring in the harness has been pre-terminated to proper connector and all wire has been color-coded. All wiring is 600 volt, 275° F, TXL. Standard automotive wire is GPT, 300 volt, 176°F, with PVC insulation.

This harness is divided into three major groups:

Engine Group	Includes wiring for the fuel injectors, distributor and sensors.
Dash Group	Includes ignition feed wires, assembly line diagnostic link (ALDL) connector, check engine light, computer connectors, tachometer wiring, relays and fuse block.
Tail Group	Includes power wire for the fuel pump.

## 2.0 About these instructions

These instructions provide information for the installation of the 65105 LT-1 (92-97) fuel injection harness kit. The contents of these instructions are divided into major **Sections**, as follows:

- 1.0 Introduction
- 2.0 About These Instructions
- 3.0 Tools Needed
- 4.0 Contents of the 65105 Wiring Harness Kit
- 5.0 Pre-Installation and Harness Routing Guidelines
- 6.0 General Installation Instructions
- 7.0 GM 1992-1997 LT-1 System Wire Harness Installation
- 8.0 Trouble Shooting Instructions

**Sections** are further divided into **Paragraphs** and **Steps**. Throughout, the **Figure** numbers refer to illustrations and the **Table** numbers refer to information in table form. These are located in or near the sections or paragraphs to which they correspond. Please pay special attention to any **Notes** or any labeled **CAUTION**.

## 3.0 TOOLS NEEDED

In addition to your regular tools, you will need, at least the following:

**Crimping Tool**  
**Wire Stripper**  
**Continuity Tester**

**Note: Use a quality tool to avoid over-crimping.**

**CAUTION: Do not use a test light to test the computer or sensor wiring or you will damage the computer.**

**Electric Drill**  
**1 5/8" Hole Saw**  
**Digital Voltmeter**

(for the rubber grommet in the firewall)

## 4.0 CONTENTS OF THE 65105 WIRE HARNESS KIT

Take inventory to see that you have everything you are supposed to have in this kit. If anything is missing go to your dealer where you purchased the kit or contact Painless Performance at (800) 423-9696. This kit should contain the following items:

- \*The main wiring harness with, the connectors already on the ends of most of the wires.
- \*PERFECT ECM 65105
- \*Fuel Injection Installation Instructions, part number 90537 (this booklet)
- \*Distributor, Idle Air Control and Throttle Position Sensor Adaptors

## 5.0 PRE-INSTALLATION AND HANRESS ROUTING GUIDELINES

The installation of your harness kit will consist of two (2) steps

- \* The physical routing, positioning and securing of the harness, wire groups and individual wires and connectors.
- \* The proper electrical connection of the individual circuits.

We cannot tell you how to route the harness in your vehicle. That depends a great deal upon the particular make of the vehicle and what extent you want to secure and conceal the harness. We do offer some general guidelines and routing practices starting in **Paragraph 5.1.3**, general installation instructions in **Section 6.0** and precise instructions concerning the electrical connections you will have to make beginning in **Section 7.0**. To help you begin the installation of your wire harness, read the following sections:

### 5.1 Understanding the engine that you are using.

- 5.1.1 The 1992-1997 LT-1 engine has two (2) oxygen sensors, one on the right side and one on the left side of the engine. Depending on the model of vehicle that the engine came out of you may or may not have two (2) knock sensors, one on the right side and one on the left side. For both the oxygen and knock sensors the PERFECT system has been designed to only require one of each sensor. You will reuse both the right side (passenger) O2 and right side knock sensor.
- 5.1.2 Painless Performance recommends the use of the following parts. See **Table 4.1**. These will meet all requirements and are compatible with this Painless Performance harness and controller. The following numbers listed in **Table 4.1** are GM or AC Delco part numbers, except for the 60126 part number which is a Painless number (for 1996-1997 engines only).
- 5.1.3 Familiarize yourself with the harness by locating each of the harness groups and by looking at the connectors on the wire ends.
- 5.1.4 Decide where and how the computer and relays will be mounted. Painless Performance wire harness kits are designed to mount both under the dash or in the kick panel side of the vehicle. They must be no further apart than the wiring will allow (approx 10 inches).
- 5.1.5 A good exercise is to lay out the harness on the floor beside your vehicle and identify all the connectors and wires.
- 5.1.6 You will want to route the harness through and around open areas. Inside edges provide extra protection from hazards and also provide places for tie wraps, clips and other supports.
- 5.1.7 Route the harness away from sharp edges, exhaust pipes, the hood and door hinges.
- 5.1.8 Plan where harness supports will be located. Use support approximately every 6 inches unless the harness routes under the carpet floor.
- 5.1.9 Allow enough slack in the harness at places where movement could possibly occur (body to frame, frame to engine, etc.).
- 5.1.10 The wires should be bundled into groups. Use tape, nylon ties or split loom.

<b>65105 LT-1 Fuel Injection Harness (1992-1997)</b>			
Intake Air Temperature.....	12110319	Manifold Absolute Pressure.....	16137039
Ignition Module.....	D-1986-A	Idle Air Control.....	17113099 <sup>1</sup>
Coolant Temp. Sensor.....	25036979	Oxygen Sensor.....	AFS-105
Coil.....	D-573 <sup>2</sup>	Knock Sensor.....	10456126 <sup>2</sup>
<p><b>Note: Other parts may plug into the harness, but the part numbers <u>must</u> match the ones on this list for proper operation.</b></p> <p>1. An adapter is included to adapt the 4-pin square IAC connector to the 1994-97 flat 4-pin IAC connector.</p> <p>2. If you have a 1996 or 1997 engine you will need to purchase Painless Performance part number 60126 for the correct Coil, Coil Output and Knock Sensor.</p>			

**Table 4.1** Compatible Parts

## 6.0 GENERAL INSTALLATION INSTRUCTIONS

### CAUTION:

- **DO NOT DISCONNECT THE BATTERY OR THE COMPUTER CONNECTORS WHILE THE IGNITION IS ON.**
- **DO NOT SHORT ANY WIRES IN THIS HARNESS TO GROUND (WITH THE EXCEPTION OF LABELED GROUND WIRES) OR DAMAGE TO THE COMPUTER WILL RESULT.**
- **GIVING OR RECEIVING A “JUMP START” MAY DAMAGE THE COMPUTER.**
- **DO NOT USE A TEST LIGHT WHEN TESTING COMPUTER SENSORS OR COMPUTER CIRCUITS. DAMAGE TO THE COMPUTER WILL RESULT!**

### Notes:

- There is a normal, small drain of the battery on these fuel injection systems.
- Each connector in this harness is different and will not fit in the wrong place.
- **Never Force any Connector**
- When connecting the plugs to the computer **use extreme care** to make sure none of the pins in the computer are or become bent.
- The fuel pump you are using **MUST** be rated at a minimum of **45 PSI** (lbs. per square inch). Place the fuel filter in the **pressure** side of the pump for best possible operation.

## 6.1 GROUNDING THE VEHICLE

A perfectly and beautifully wired vehicle will nevertheless have problems if everything is not properly grounded. Don't go to the effort to installing a quality wire harness only to neglect proper grounding.

- 6.1.1 Connect a ground strap or cable (minimum of a 4 GA. wire) from the negative battery terminal to the chassis (frame).
- 6.1.2 Connect a ground strap (minimum of a 4 GA. wire) from the engine to the chassis (frame) **DO NOT RELY UPON THE MOTOR MOUNTS TO MAKE THIS CONNECTION.**
- 6.1.3 Connect a ground strap from the engine to the body.

## **6.2 ROUGH INSTALLATION**

**CAUTION: DISCONNECT THE POWER FROM YOUR VEHICLE BY REMOVING THE NEGATIVE BATTERY CABLE FROM THE BATTERY.**

**Note: Make no wire connections or permanent mounting of any kind at this time.**

- 6.2.1 Position the computer, fuse block and relay bases in their intended locations.
- 6.2.2 Drill a 1 5/8" hole for the firewall grommet near the computer for the engine group and tail sections to pass through.
- 6.2.3 Route the engine group and tail sections through the hole. Push the grommet (already installed on the harness) into the hole until it is seated.
- 6.2.4 Route the dash group over to the driver's side of the vehicle.
- 6.2.5 Route the fuse block and relay bases to where they will be mounted.

## **6.3 HARNESS ATTACHMENT**

**Note: Harness routing and shaping will be a time-consuming task. Taking your time will enhance the beauty of your vehicle. Please take your time and be patient.**

- 6.3.1 Permanently mount your computer. You should mount the parts (sensors, relays, etc.) that will be used for your engine at this time. These parts will vary by application.
- 6.3.2 Mold harness groups to the contour of the dash, engine, frame, etc. Remember to route harness away from sharp edges, exhaust pipes, hinges and moving parts.
- 6.3.3 Attach harness groups to your vehicle with clips or ties starting at the computer and working your way outward.

**Note: Do not tighten tie wraps or mounting devices at this time. Make all harness attachments LOOSELY.**

- 6.3.4 When used every 1 1/2" or so on the visible areas of the harness, colored plastic wire ties make a very attractive assembly. Otherwise, a tie installed in other areas every 6" or so will hold the wires in place securely. **Remember to take your time.**



## 7.0 GM 1992-1997 LT-1 SYSTEM WIRE HARNESS INSTALLATION

### 7.1 SPECIFIC CIRCUIT CONNECTION

**Note:** If you have not already done so, read sections 5.0 and 6.0 of these instructions and think through the installation of the harness before securing or cutting any wires.

### 7.2 DASH SECTION INSTALLATION

The wires in this group consist of the assembly diagnostic link connector (ALDL) (SEE **FIGURE 7.1**), the check engine light (pre-mounted into a bracket) and four (4) other wires.

**Note:** You may need to connect the check engine light wire to their mates in the wire harness.

**CAUTION:** DO NOT MAKE ANY CONNECTIONS WHILE THE COMPUTER IS PLUGGED INTO THE HARNESS.

**Note:** Wire color (Example: Blk/Wht) is one wire with a stripe. The second color (the stripe) may not be bold. Observe all two-color wires closely.

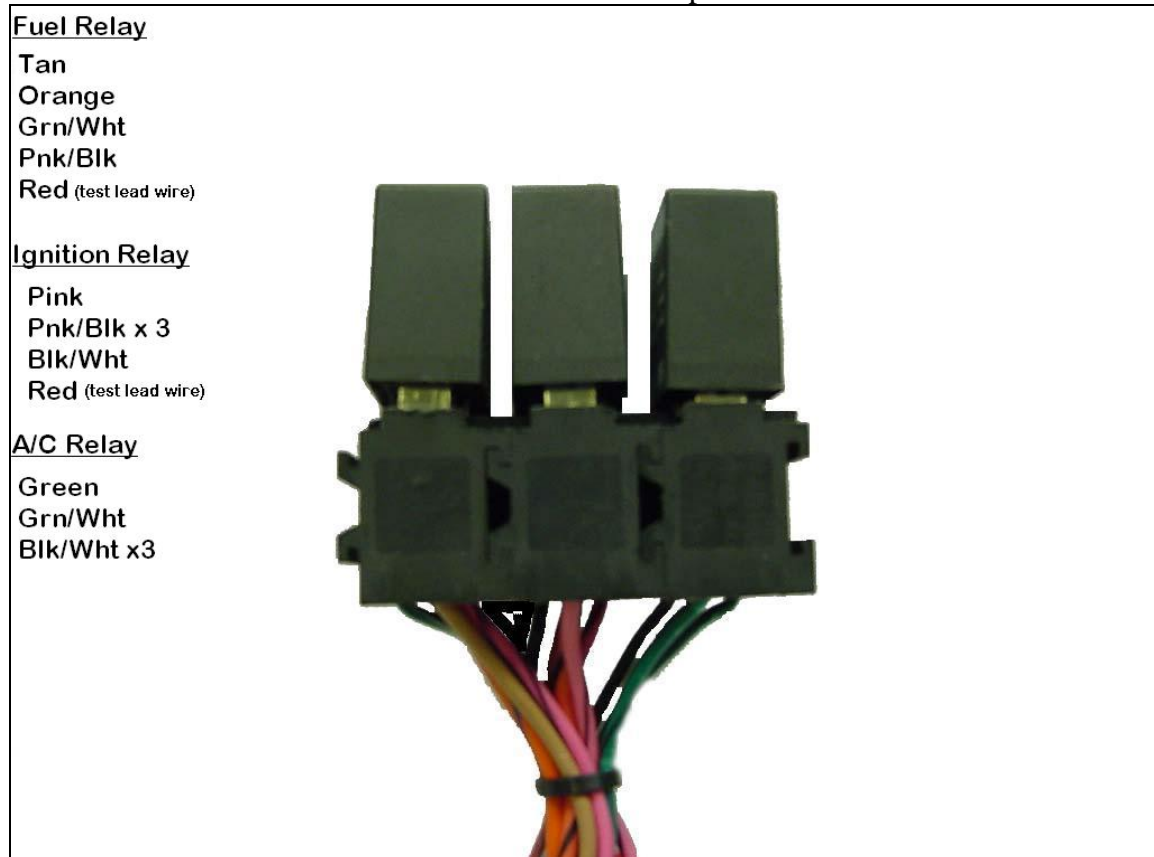


**FIGURE 7.1** Assembly Line Diagnostic Connector (ALDL)

- A. Find a suitable location to mount the ALDL connector that will allow access to the front of the connector and still allow you to see the light while driving.
- B. Mount the ALDL connector and the check engine light in the place selected.
- C. Locate the PINK ignition hot activation wire, labeled “Fuse Block Ignition B+ (18 GA.) for the fuse block and attach it to a 12V **fused** power source where there is power **WHEN THE KEY IS IN THE START AND RUN POSISTION**. This is the ignition feed power wire for the harness. If the pink wire is connected correctly, the check engine light will come on when the ignition is “ON or in START”.

The three relays that have been supplied for you in the kit are the following:

Fuel Pump Relay	This relay will supply the 12V ignition hot power to your fuel pump when the key is on and in start
A/C Signal Relay	This relay will supply a ground for the computer to increase engine RPM when the A/C compressor has been turned on.
Ignition Relay	This relay will supply 12V ignition hot power to the O2 sensor, check engine light and computer when the key has been turned on or start position.



**FIGURE 7.2** 65105 Relays and Relay bases

**Note:** You will have to install the relays in their housing after mounting the bases.  
**All three relays are identical.**

**Note:** The little RED wire with the female terminal that comes out of the IGN. and Fuel Pump relay bases is a test lead only. It is not connected to anything. See Section 8.1

### 7.3 ENGINE GROUP INSTALLATION

The engine group is designed to be separated into left side (driver) and right side (passenger) sections. Each side is tie-wrapped separately, **but not labeled**. The right side of the engine has connectors for the idle air control, throttle position sensor, distributor, injectors and map sensor, all of which **are** labeled. When you begin routing, **first** separate the engine group into left and right sections and place them accordingly.

- 7.3.1 Before you connect any wires, separate the tail section (fuel pump wire) from the engine group and place it out of the way.
- 7.3.2 Locate the two separate Blk/Wht wires in the harness that each end in a ring terminal and ground them to the engine each on their own separate ground source.
- 7.3.3 Using **Figure 7.1** thru **7.11** and the specific connections indicated in **Table 7.1**, connect the wiring as directed.
- 7.3.4 Check to make sure that the 65105 wire harness has the correct distributor connector (shown in **Figure 7.7**) on it for your particular engine. The 1992 & 1993 used the short connector (1") and the. When using this harness on 1992-1993 LT-1 engines please call the Painless tech hot line and request a WH-399 distributor pigtail. The 65105 harness includes in the kit the 1994-1997 long connector (2") see **Figure 7.8**. Plug in the correct pigtail to match your distributor.
- 7.3.5 Check to make sure that the 65105 wire harness has the correct Throttle Position Sensor connector on it for your particular engine. If you have a round style TPS you will need to find the pigtail adaptor in the kit a connect it to the TPS plug that is already on the harness. The other end of the pigtail will have your style of plug.
- 7.3.6 Check to make sure that the 65105 wire harness has the correct Idle Air Control connector on for your engine. If you have a square for pin plug you will need to remove the pigtail that has already been placed onto the harness.
- 7.3.7 The Pink wire labeled Coil Power needs to be connected to the wire that powered the coil on the original engine, or route to a fused ignition switched 12V power source.
- 7.3.8 The GRN wire tagged A/C POWER attaches to the A/C compressor power wire at the compressor if the vehicle is so equipped. This will increase the engine's RPM when the A/C is turned on.

## 7.4 TERMINAL INSTALLATION INSTRUCTIONS

**Note:** In the following steps you will be making the circuit connections. Before you start, you should carefully read SECTION 7.0 and continually refer to the wire charts, double-checking your length calculations before cutting any wire or making any connections. These directions are for the wires, which do not have a connector already installed on them.

- 7.4.1 Have all tools and connectors handy.
- 7.4.2 Select the correct terminal for the wire and application.
- 7.4.3 Determine the correct wire length and cut the wire. Remember to allow enough slack in the harness and wires at places where movement could occur. **Double-check your calculations.**
- 7.4.4 Strip insulation away from the wire. Strip only enough length necessary for the type of terminal lug you are using.

**Note:** In the following steps, make sure that the terminal is crimped with proper die in the crimping tool. An improper crimp will not make a good connection. **DO NOT OVER CRIMP.**

- 7.4.5 Crimp the terminal onto the wire.
- 7.4.6 Connecting the wires and connectors throughout the harness is a repeating process. Make sure that each wire is properly routed and then attached. **Do not attach then route afterward.**
- 7.4.7 When all the wires are attached, tighten the mounts and ties to secure the harness permanently.
- 7.4.8 Attach the connectors to the computer. **Being very careful not to bend any pins.**
- 7.4.9 After all the connections have been made throughout the harness, connect the battery to the vehicle.

**CAUTION:** **BE SURE THE IGNITION IS OFF WHEN YOU RECONNECT THE BATTERY OR YOU WILL DAMAGE THE COMPUTER.**

## 7.5 TAIL SECTION INSTALLATION

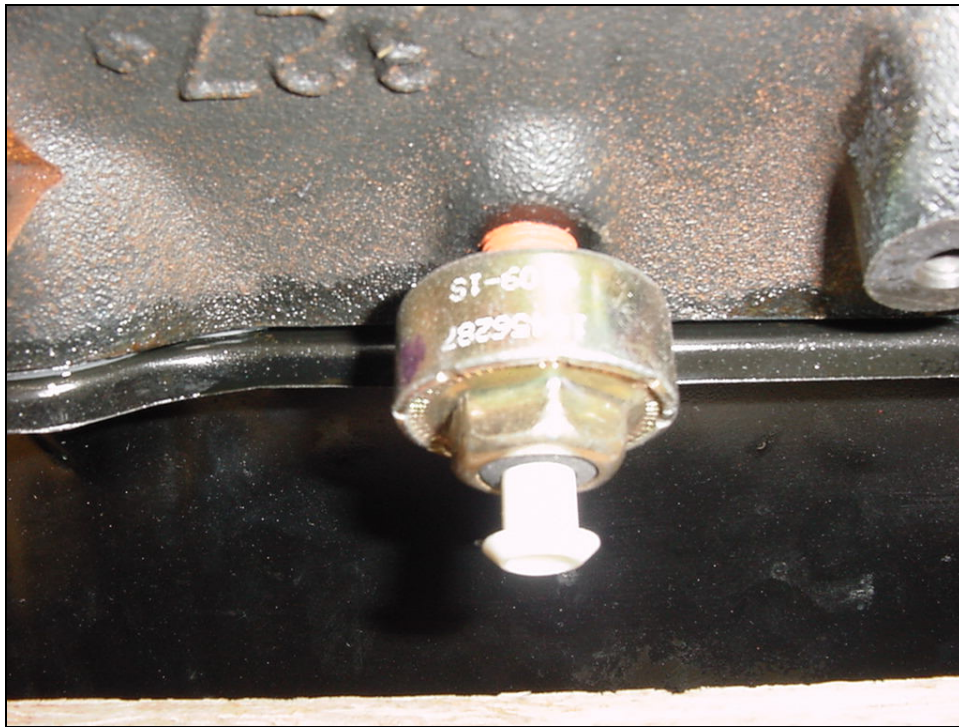
- 7.5.1 Locate the tail section that you earlier separated from the engine group. Begin routing it towards the rear of the vehicle. Be sure to avoid all sharp edges, moving or hot parts, or anything else that may damage the harness.
- 7.5.2 Take the gray wire and route it to the fuel pump. This is the ignition 12V power wire for the fuel pump.

Wire Colors	# of Connectors in Connector	Labeled	Connects to:
Red/Blk,Pnk/Blk Red	4	DIST.	Distributor
Blk/Wht,Pnk/Blk Pur. , Blk	4	OYX	O2 Sensor
Blu.,Pnk/Blk or Grn.,Pnk/Blk	8	INJ #	Injectors
Dark Blue	1	KNOCK	Knock Sensor
Tan, Blk.	2	IAT	Intake Air Temp.
Blk., Blue, Gray	3	TPS	Throttle Position Sensor
Lt. Blu./Wht, Lt.Blu./Blk Lt.Grn/Wht, Lt.Grn/Blk	4	IAC	Idle Air Control
Yellow,Blk	2	CTS	Coolant Temp.
Red		STARTER	Battery B+
Lt.Grn, Gry., Blk.	3	MAP	Map Sensor
Wht., Blk., Pnk/Blk, Wht/Blk	4	IGN MOD	Ignition Module
Pnk., Wht.	2	COIL	Ignition Coil
Pnk/Blk, Wht/Blk	2	COIL	Ignition Coil
Blk/Wht	2	GROUND 1&2	Engine Ground

**Table 7.1** LT-1 Harness Connection Overview part#1

Wire Colors	# of Positions in Connector	Labeled	Connects to:
Gray		FUEL	Fuel Pump
Pnk.		COIL B+	Power for Coil
Pnk.		IGN B+	Ignition B+
Wht.		TACH	Tachometers

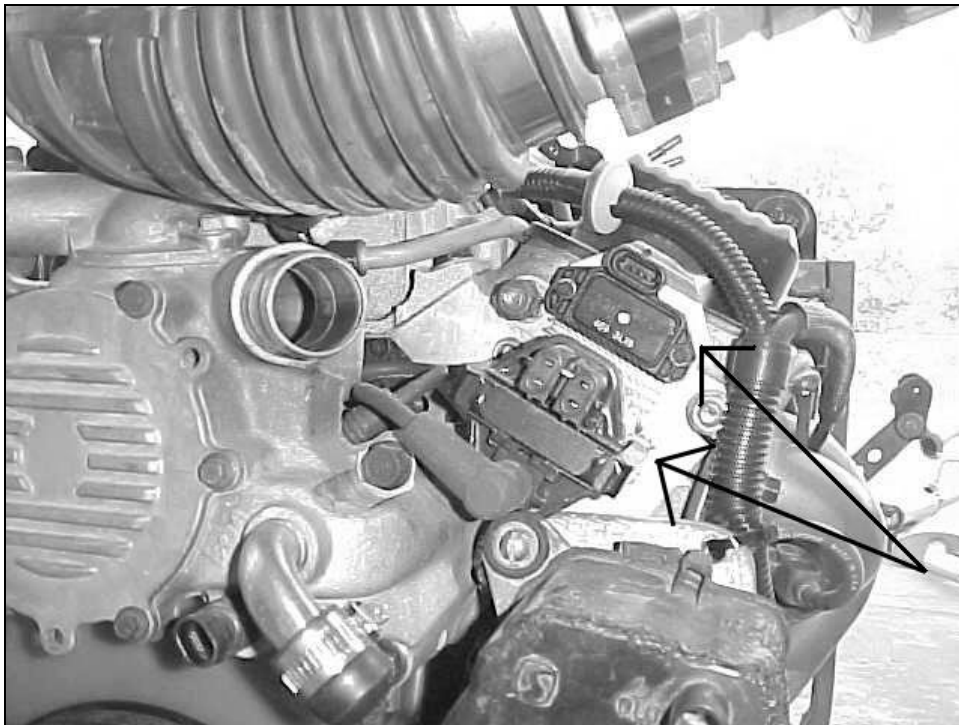
**Table 7.1** LT-1 Harness Connection Overview part #2



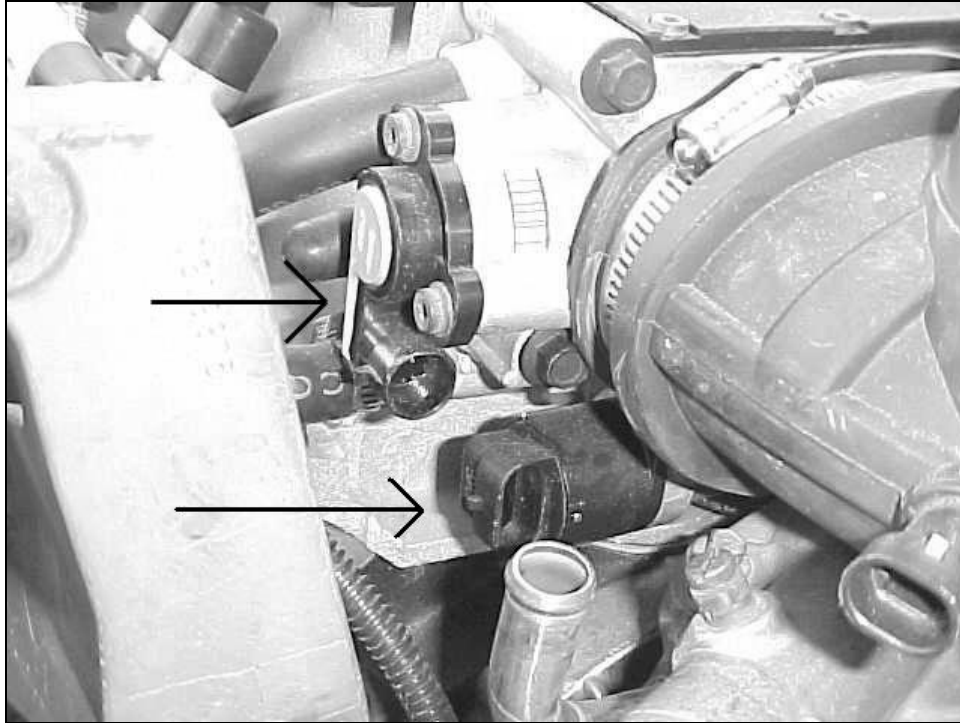
**Figure 7.3** Knock Sensor



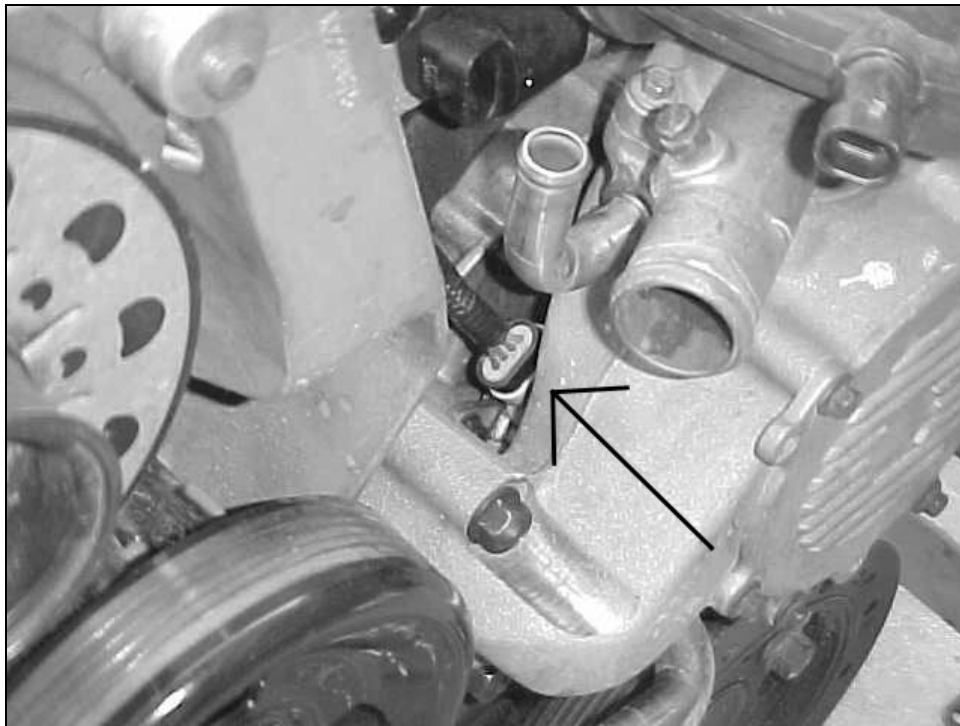
**Figure 7.4** Oxygen Sensor



**Figure 7.5** Ignition Module (top arrow) and Coil (bottom arrow)



**Figure 7.6** Throttle Position Sensor (TPS) (top) and Idle Air Control (IAC) (bottom)

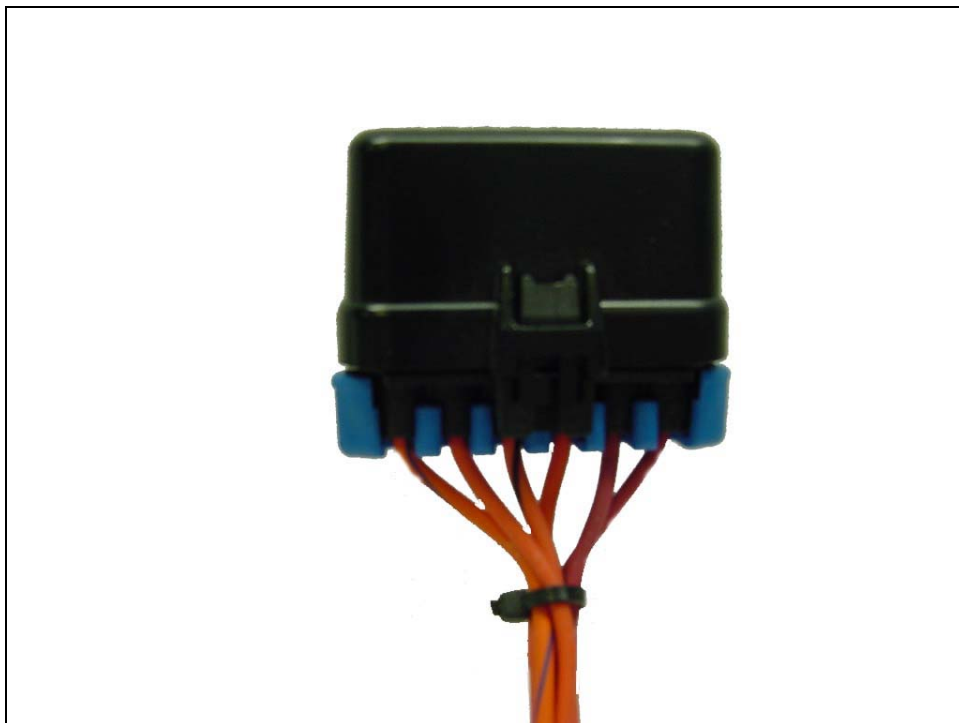


**Figure 7.7** Distributor Connection

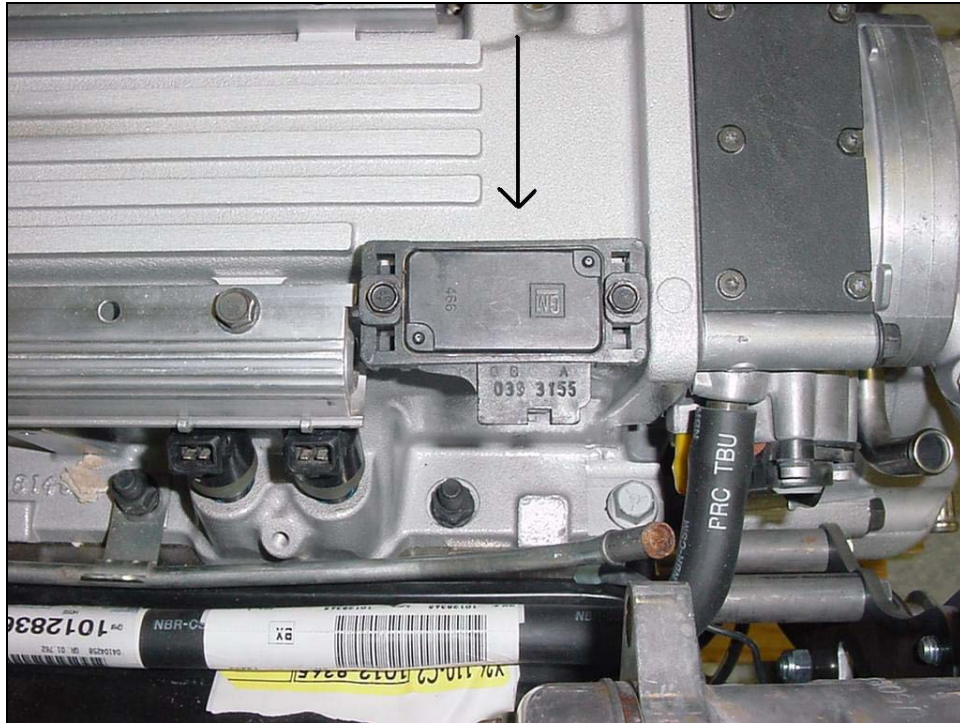




**Figure 7.8** Distributor Pigtails ('92 & '93) 1" Top ('94-'97) 2" Bottom



**Figure 7.9** LT-1 Harness Fuse-block



**Figure 7.10** Manifold Absolute Pressure Sensor



**Figure 7.11** PERFECT ECM

## 8.0 TROUBLE SHOOTING INSTRUCTIONS

**Note: Only scanners with marine cartridges and marine cable plugs will communicate with the PERFECT computer.**

If you are having trouble with your engine running badly or not running at all, first perform basic trouble shooting (checking for faulty connections, spark, fuel pressure, etc.) then see if the computer has stored any trouble codes in its memory.

### 8.1 THE FUEL RELAY TEST WIRE

The small RED wire that is coming out of the relay is a TEST lead wire. If you do not hear your fuel pump prime when you turn on the ignition take a jumper wire and connect it from a 12V power source to the RED wire coming out of the FUEL PUMP RELAY. By supplying 12V to that wire you are bypassing the relay completely. You should hear the pump run. If you do not hear anything make sure that all connections are good and the pump has a good ground.

### 8.2 THE CHECK ENGINE LIGHT

Normally, the “check engine” light should come on when ignition is initially turned on, and then go out few moments after the engine starts running. If the computer has detected a problem and a fault code has been set the light will come back on.

8.2.1 The computer identifies particular trouble codes by flashing the “check engine” light in a certain way. The codes are read by counting flashes:

- A: The first digit (the “tens” digit) of the code is flashed quickly, followed by a brief pause, then the second digit (or “ones” digit) is flashed, followed by a longer pause. For example, three (3) quick flashes followed by a brief pause followed by two (2) flashes indicate a code 32.
- B: The code will repeat itself. The next code, if any, will be displayed in the same manner.

**Note: When you access the codes from the computer a code 12 (one flash followed by two flashes) will first be displayed. THIS DOES NOT INDICATE A PROBLEM. Code 12 will be flashed 2 times, followed by the particular trouble codes, if any. If the computer merely flashes code 12 there are no trouble codes stored. Code 12 means the engine is not running.**

### 8.3 RETRIEVING TROUBLE CODES FROM THE COMPUTER

- 8.3.1 In order to retrieve the trouble codes stored in the computer, locate the ALDL plug installed in **Section 7.2**. Turn the ignition on, BUT DO NOT START THE ENGINE. Connect a jumper wire from the ALDL terminal “A” to terminal “B” see **Figure 7.1** and observe the check engine light.
- 8.3.2 If you have read any codes (remember the normal code 12), write them down for reference Remove the jumper wire from the ALDL connector.
- 8.3.3 Take the codes one at a time and match them to the codes in **Table 8.1**. This will tell you in which circuit the computer has detected a problem.

**Note: A code indicated a problem is a specific circuit, NOT THAT A PARTICULAR PART IS BAD.**

- 8.3.4 Before taking more extensive corrective actions for any trouble codes, make sure that all connections on the indicated circuit, INCLUDING the computer, are clean and tight. Inspect the wiring in the circuits for any broken, shorted, or exposed wires. Finally, insure all ground wires are clean and secure.
- 8.3.5 If you are getting a code from your computer and need to clear the code, other than 12, after you have replaced a part, readjusted a part, etc. You can do this by making the following steps.
  - A: Install a jumper wire from terminal A to terminal B
  - B: Ignition ON engine OFF
  - C: Move throttle from 0% (idle) to 100% (WOT) and back to 0%.
  - D: Remove the jumper wire.
  - E: Turn ignition OFF for at least 20 seconds.
  - F: Ignition ON engine OFF
  - G: Recheck for codes.

<b>Code #</b>	<b>Circuit affected</b>
13	Oxygen Sensor
14	Coolant Temp. High Voltage (COLD)
15	Coolant Temp. Low Voltage (HOT)
21	Throttle Position Sensor (high voltage)
22	Throttle Position Sensor (low voltage)
23	Intake Air Temp. Low Voltage (HOT)
25	Intake Air Temp. High Voltage (COLD)
33	MAP Sensor Circuit (high voltage)
34	MAP Sensor Circuit (low voltage)
41	Ignition Control Circuit (open IC circuit)
42	Ignition Control Circuit (grounded IC)
44	Knock Sensor Inactive
54	Heated Oxygen Low Voltage (lean)
55	Heated Oxygen High Voltage (rich)

**Table 8.1** Diagnostic Trouble Code Chart

## **8.4 WHEN TO CALL PERFECT PERFORMANCE PRODUCTS TECH LINE**

- 8.4.1 These harness kits have been built with the highest regard to strict quality control and tested before shipment. Before calling use please double check all connections and perform normal basic trouble shooting (fuel pressure, ignition, spark, etc.).
- 8.4.2 If you have any questions concerning the installation of this harness or are having trouble in general; feel free to call Painless Performance tech line at (800) 423-9696. Calls are answered from 8 AM to 5 PM CST, Monday-Friday, except holidays. Please leave a message if you are unable to reach us and we will return your call as soon as possible.

**Note: HELPFUL INFORMATION ON THE PERFECT ECM CALIBRATIONS.**

The PERFECT ECM has been specifically calibrated for your particular engine. This computer will NOT work with any other type of engine, nor will it work with a modified engine. The computer has been programmed with a REV. limit set @5,000 RPM. If your computer was to detect an engine malfunction it will first set the “check engine” engine light and then proceed to place itself into a “safe mode”. This “safe mode” will still allow you to drive your vehicle, but it will not allow you to drive over 1,300 RPM. The computer will not take itself out of “safe mode” until the malfunction has been corrected. The computer will place itself into “safe mode” even if your vehicle starts to over-heat. Once the engine cools down the computer will place itself out of the mode and return back to normal functions. Engine over-heat temp. has been set at 250°.

E-mail: [tech@painlessperformance.com](mailto:tech@painlessperformance.com)

WEB: [www.painlessperformance.com](http://www.painlessperformance.com)

**Painless Performance Limited Warranty  
and Return Policy**

Chassis, fuel injection harnesses, and Striker ColdShot units are covered under a lifetime warranty.

All other products manufactured and or/sold by Painless Performance are warranted to the original purchaser to be free from defects in material and workmanship under normal use. Painless Performance will repair or replace defective products without charge during the first 12 months from the purchase date. No products will be considered for warranty without a copy of the purchase receipt showing the sellers name, address and date of purchase. You must return the product to the dealer you purchased it from to initiate warranty procedures.

# **PERFECT**

## **ENGINE MANAGEMENT SYSTEM<sup>®</sup>**

### **PERFECTION CalTool**

**P/N: 65245**

**Manual #90549**



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If you have any questions concerning use of this software or having trouble in general, please feel free to call Painless Performance Products' tech line at 1-800-423-9696. Calls are answered from 8am to 5pm central time, Monday thru Friday, except holidays.

We have provided as accurate instructions as possible, and are always concerned about improvements to be made. Any comments or suggestions concerning these instructions please send a fax to (817)244-4024 or e-mail is always welcome at [painless@painlessperformance.com](mailto:painless@painlessperformance.com). We appreciate your business.

**Perfect Performance Products, LLC** shall in no event be liable in contract or tort (including negligence) for special, indirect, incidental, or consequential damages, such as but not limited to, loss of property damage, or any other damages, costs or expenses which might be claimed as the result of the use or failure of the goods sold hereby, except only the cost of repair or replacement.

P/N 90549

December 06, 2007  
Revision #3 07/10

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Congratulations, on the purchase of the **Perfect Engine Management** fully tunable fuel-injection system. This booklet is designed as a guide through the tuning process. Tuning an injection system can be tricky and at times very complex, but with patience and some general guidelines, a superb running engine can be accomplished.

## **This kit contains the following parts:**



- Instruction Manual #90549
- USB Key
- Software CD w/Case
- Gray communication cable
- NGK Wide Band Interface Cable

**NOTICE: This kit is ONLY compatible with Windows XP. It will not work with Windows Vista or Windows 7.**

**This kit does not include a USB to Serial adaptor. Keyspan® company ([www.keyspan.com](http://www.keyspan.com)) makes a very easy to use unit P/N USA-19HS. This is the ONLY adaptor which is compatible with this kit. This adaptor must be purchased for this kit and is available from most electronics suppliers.**

# **Installing the Software**

1. Start by placing the Software CD into the CD/DVD drive on the desired computer and close the drive door. The software will automatically start an installation wizard and walk you through the installation process.
2. Follow each step in the wizard and finish the software installation process. At the end when it asks if you would like to start the software, remove the check from the box and close the window.
3. Now that the software has been installed onto your computer; there is an icon on your computer titled, "InGenius Perfect v2.2."
4. **Now insert your purple USB key into a port on your computer.**
5. Double click on the InGenius Perfect v2.2 icon on the desktop or go to START>All Programs>Painless Performance>Ingenius Perfect v2.2>Ingenius Perfect v2.2.
6. Now you can navigate through the software as explained in these instructions. Please read about each section and what changes it allows.
7. If you are ready to connect to your car with the Perfect System installed (it won't work sitting on a workbench disconnected from your engine), place the CD that was included with your new KeySpan USB to Serial adaptor (P/N USA-19HS) and install the software as per the KeySpan software wizard.
8. Now connect the USB to Serial adaptor to the computer, connect the gray communication cable to the USB to Serial adaptor and then, with the ignition **OFF** plug the communication cable into the PERFECT engine harness.
9. After the software opens, turn the ignition to the **ON** position and watch for the red icon on the lower right hand corner of the screen to turn yellow and then green.  
  
*\*If the icon did not change colors, the ECM and laptop are not communicating. Click the Run button on the top of the screen one time, wait three seconds and then click it again. If the icon on the bottom of the screen still does not change, go to OPTIONS>Settings>Communication>and pick a different COM port. If it was set to COM 1 then try COM 3. Try each different Com Port until the icon on the bottom of the screen turns green. Each time a different Com Port is tried, the RUN button on the top of the screen will need to be toggled on and then off.*
10. **IMPORTANT/IMPORTANT/IMPORTANT: ALWAYS CLICK RECEIVE FOR THE FIRST TIME WHEN THE SOFTWARE CONNECTS TO THE ECM. If you send a blank calibration to the ECM it will erase the ECM and it will be necessary to send it back to Painless to be recalibrated. THIS IS A VERY IMPORTANT DETAIL TO NOT MISS.**

11. On part numbers 65140, 65141, 65252, and 65253 it is necessary to save the calibration onto your computer once you have received it. These calibrations are not in the software package where they can be retrieved once they are modified.
12. In order to load a calibration into the ECM, go to Calibration>Open>Calibrations>  
**And then pick the appropriate calibration for your PERFECT SYSTEM. For example, A GM Tuned-Port Engine uses the L98 calibration.**
13. Click on the desired calibration, open it and now click<SEND>. Do not turn off the ignition or try to start the vehicle until it's completed downloading the cal to the ECM.
14. Now cycle the ignition off, wait seven seconds and then turn it to the On position.
15. **Providing the engine, fuel system, and wiring installation is complete, turning the key to the start position should fire up the engine. Be sure to check the fuel pressure is at the specific pressures for your engine.**

## Section 1: General Tuning Guidelines

**The adjustments available in this software have the potential to seriously damage the engine, if** not done in the proper way. If a leaner than required mixture or too much spark timing is programmed into the engine ECM, detonation leading to a damaged engine will most likely occur. The calibrations provided for each engine are a good base to start programming from. Most of the time the spark tables for each engine combo will not need to be changed from the ones provided. When larger than stock camshafts are installed into an engine the idle and just off idle spark timing may need to be slightly advanced. The fuel tables and idle setup are most often in need of tuning. However, if the fuel/air mixture is too lean engine damage is imminent under sustained heavy loads. A rich condition will usually just produce clouds of black smoke from the exhaust pipe or even foul spark plugs.

## Section 2: Dashboard

This screen serves as a "Scan Tool" for the PERFECT systems. The Dashboard shows live sensor data, (RPM, TPS, MAP, O2, and ECT), etc, when the engine is running or the key is in the ON position. This sensor data is used to analyze engine performance, sensor functionality and monitor critical sequences of events. For example, with the key on engine off, if the accelerator is not being pressed at all, the TPS gauge should read "0%". Then with the accelerator pressed to the floor, the TPS gauge should read "99.6%". The throttle adjustment is explained in more detail in Section 3: Idle.

The Dashboard can be customized by adding different gauges with each displaying different parameters and controlling how each parameter is displayed. Simply right click the mouse, choose "Design mode", then right click the mouse again and select "New Gauge". A window displaying all of the available features for each gauge will popup. Simply click on each tab and make decisions based on the appearance and function of the gauge desired. Many of the most important gauges come preset in this software package and can be modified at anytime. Once any design changes have been made, simply go to File-Save Workspace and save any changes that have been made.

## Section 3: Fuel

These screens contain the main Base Fuel Table with the fuel injector pulse width values. The values are in milliseconds of injector firing time or in other words, "How long the injector is open and allowing fuel to be sprayed into the engine". Other adjustments in this section are simply a multiplier being applied to the values in the Base Fuel Table to increase or decrease the amount of fuel under specific conditions. It is critical the base fuel table values are as accurate as possible.

See below for a description of how each adjustment is made in the Fuel screen:

## 1. Main – Base Fuel Table

- RPM (Revolution per Minute) vs. MAP (Manifold Absolute Pressure) Sensor values in KPA (Kilopascals) These are the “X” and “Y” coordinates of the table.
- How much fuel will the engine efficiently burn at a specific RPM? If the engine was held at a constant RPM and MAP(Load) listed on the Base Fuel Table, then the amount of fuel the injector will deliver is directly proportional to how many milliseconds the injector is command to be open.
- It is crucial, when making adjustments to these values; the Coolant and Intake Air Temperature Compensation multipliers are set to 1.00 and the Transient Fuel multipliers must be set to 0. Only then will the engine be running solely on off the Base Fuel Table numbers. The O2 sensor selection in the **Setup menu** must be set to either “No Fuel Trim” or when present “Wideband Monitor”. This is to prevent any Closed Loop O2 fuel trim. This fuel injection system is **only** compatible with the NGK AFX wideband system. Call your local Painless Performance dealer for more details.
- Painless has provided base calibrations for each engine supported, so be sure and start with the correct engine base calibration.

## 2. Compensation – Coolant Temperature and Intake Air Temperature

- Coolant Temperature – These values are multiplied to the Base Fuel Table values to richen the mixture when the engine coolant, hence the engine, is cold. Or another way of looking at it is, it leans out the mixture as the engine warms up. Generally speaking, the values warmer than 176deg F should be 1.00. This would mean there is no enrichment due to the engine not being at running temperature.
- Intake Air Temperature – These values are multiplied to the Base Fuel Table values to richen the mixture when the intake air is cool and to lean out the mixture when the intake air is hot. It’s best to use the Coolant Temperature to do most of the cold enrichment when the engine is cold and the Intake Air enrichment to fine tune fueling via air temperature.

## 3. Crank Fuel

- Crank Fuel Prime – This is the initial shot of fuel from the injectors, comparable to throttling a cold carbureted engine before startup. The amount of fuel needed will vary with each different engine combination. Generally, more fuel is needed for quicker starts on engines with larger lift and duration camshafts. Watch for an overly large puff of black smoke out of the tailpipe during startup for an indication if the values in these fields are too large.
- Crank Fuel – This is the amount of fuel sprayed into the engine from 0 rpm to 300 rpm. Colder temperatures require more fuel. Watch for an overly large puff of black smoke from the tailpipe for an indication of too much fuel during startup.
- Crank to Base Fuel Compensation – These values are multiplied to the Base Fuel Table values and are used to gradually pull out the overly rich mixture during cranking. Once the engine speed is greater than 300 rpm, these values will start tapering off the amount of fuel being injected into the engine. Think of this as the transition to the Base Fuel Table while the engine is firing up. It’s equivalent to the choke pull-off on a carburetor.

- Blend Time – This is the time it takes to transition from Crank Fuel to the Base Fuel Tables. Larger times here will slow down the transition and keep the fuel mixture rich longer. Smaller times here will speed up the transition and shorten the amount of time the mixture is richer. If the engine acts like it's about to die after it first fires up, this value may need to be increased dependent upon if the Air/Fuel ratio measured in the exhaust goes lean and the engine stumbles.

#### 4. Transient Fuel

- MAP Acceleration Enrichment - These values are multiplied to the Base Fuel Table values to richen the mixture when there's a change in the amount of engine vacuum. Engine vacuum can be directly translated into the amount of load being applied to an engine. With increased load, the engine will need more fuel to continue to do the same amount of work. Only with a change in the engine vacuum (load) will these fuel multipliers be applied to the mixture.

##### **Fuel Multiplier based on Delta Manifold Pressure (0 to 31.13 msec)**

- "**Delta**" – means "**change in**"

- TPS Acceleration Enrichment – These values are multiplied to the Base Fuel Table values to richen the mixture when there's an increase in the amount of throttle being applied to the engine. Only on an increase in throttle will this adjustment be used by the ECM to richen the mixture. In carburetor terms, this adjustment would be the "accelerator pump". If under a hard stomp of the throttle the engine stumbles, slightly increasing these values may help to fix the problem. Watching the Air/Fuel ratio in the exhaust with a wide band O2 sensor, see if the mixture goes too lean. Under a hard acceleration, it would be normal to possibly see the AFR goes as far rich as 10 to 1.

##### **Fuel Multiplier based on Delta Throttle Position (0 to 31.13 msec)**

- "**Delta**" – means "**change in**"

#### 5. Decel Fuel Cut-off

- This enables or disables the fuel to be cut-off during a deceleration. It helps prevent and control back-firing when decelerating. It also prevents the engine from loading up with fuel during a high rpm throttle release. In most street applications, it is recommended to enable this feature for best drivability.

#### 6. Oxygen Sensor

- Idle Target A/F Ratio – This is the Air/Fuel Ratio the ECM will trim or add fuel to when in closed loop and the engine is idling. The ECM only has the authority for 20% more or less fuel. Before any closed loop fuel trim is used the Base Fuel table must be as accurate as possible.
- Target A/F Ratio – This is the Air/Fuel Ratio the ECM will learn to for each engine load (MAP) and engine rpm. The desired Air/Fuel Ratio entered in each box is where the fuel trim adjustment in the software will adjust the Air/Fuel Ratio to be. Weather conditions and Barometric pressure have an effect on how much fuel will need to be added or subtracted from the base fuel table. Understand these values are a "Target" for the ECM to reach with Fuel Correction. This is displayed on the Main

Dashboard under the O2 Sensor gauges. Fuel Correction is the percentage of fuel being added or subtracted by the ECM from the Base Fuel Table. The less fuel being added or subtracted from the Base Fuel Table the closer the values are to being correct for a given calibration.

- Enable RPM – This is the engine speed in which Closed Loop O2 Fuel control becomes active. Most stock, smooth idle engine combinations will want to enable the Closed Loop O2 control at around 600 rpm. Larger profile camshafts may require the enable rpm to be around 1500-2000 rpm.
- Disable RPM – This is the engine speed in which the Closed Loop O2 Fuel control becomes inactive.
- Coolant Temp Enable – This is the coolant temperature the engine must be up to in order to enter Closed Loop O2 control. It's best to enter Closed Loop O2 control after the engine is at operating temperature. Generally about 10-15 degrees before the thermostat opening temperature will cover most engine combos.
- Minimum Run Time – This is the minimum time the engine must be running before entering Closed Loop O2 control. The main purpose of this is for hot starts where the engine is still warmed up, but the O2 Sensor is not. If the O2 sensor is not warmed up it will not function properly and will most likely send the incorrect signal to the ECM.

## Section 4: Spark

The Base Spark Tables are developed in these screens. The sky's the limit when configuring a spark table for ignition timing, so great care must be taken when modifying these tables. If too much spark advance is calibrated into the system, severe detonation will occur. Detonation will not only hinder engine performance, but can also severely damage the engine. Engine damage will result from too much spark advance and continual detonation.

The values in these tables are in degrees of spark advance before top dead center. In other words, "The number of degrees of crankshaft rotation the spark plug fires before each piston reaches Top Dead Center." It is critical the Base Spark Table values are as accurate as possible. If the engine has detonation under a load or hard acceleration, be sure to retard the spark appropriately. Knock detection can be enabled or disabled in this section. Knock detection is useful in determining if the Base Spark Table has too much advance calibrated in it. Spark compensation based on coolant temperature and engine load can be adjusted here as well.

### 1. Main – Base Spark Table

- RPM (Revolution per Minute) vs. MAP (Manifold Absolute Pressure) Sensor values in KPA (Kilopascals) These are the "X" and "Y" coordinates of the table.
- The MAP values are a direct translation to the amount of engine load. The higher the MAP value reading indicates a larger engine load.
- Base Spark Table values should only be calibrated when the engine is fully warmed up.
- Painless has provided base calibrations for each engine platform supported, so be sure and start with the correct engine base calibration.

- When the Knock System is enabled, a gauge showing the amount of Knock Retard on the Mini Dashboard can be used to determine if the Base Spark Table needs to be calibrated.
- Generally speaking, the specific spark table provided for each engine platform supported will not need to be adjusted. Some examples of when the timing will need to be advanced more would be when a very large duration/lobe separation camshaft has been installed. The advance from idle and up to about 1500rpm would be the area to slightly increase, so a more stable idle speed can be achieved.

## **2. Compensation – Altitude and Coolant Temp and MAP**

- Altitude - This is used to add or subtract spark advance based on atmospheric pressure. The amount of atmospheric pressure is a measurement taken by the ECM every time the ignition is turned on. This directly relates to the amount of oxygen available to the engine to support combustion. Higher elevations have less atmospheric pressure; hence less air will be pushed into the engine with each piston stroke. SO, to maintain close to the same performance as in lower altitudes; advancing the timing slightly is one option.
- It is always a good idea to monitor the knock system while tuning the spark tables. If the engine is knocking/has detonation/pinging and more spark timing is added, severe engine damage will eventually occur.
- Coolant Temp and MAP – This table is designed to remove spark when both engine load and temperature are both at higher levels. As the engine is loaded and the engine speed decreases knock may occur. This is because the fuel sprayed into the cylinders is given a longer time to heat up before combustion. The amount of spark to be removed will depend on the engine combination, efficiency of the cooling system, and size/weight/gearing of the vehicle it is in. The base calibrations provided in this software package do not have values in this table.
- Knock – All systems supported with this software from Painless Performance use the knock system. It is highly recommended to leave the knock system enabled to prevent severe engine damage. The maximum amount of spark retard the knock system is allowed to enable is 10 degrees.

## **Section 5: Idle**

### **1. Idle Speed – Desired Idle Speed and Vehicle Speed Enable**

- Desired Idle Speed – This is where the idle speed of the engine is set based on coolant temperature. Higher idle speeds are recommended when the engine is cold to quicken the amount of time a cold engine takes to reach operating temperature. On the Dashboard there is an indicator called “Idle in Control of RPM” which tells if the ECM is in control of the idle speed. The throttle must be fully closed for this to occur.
- Vehicle Speed Enable – Where applicable, this tells the ECM when to go into loop idle control in relation to MPH. A good place to start is 25mph.



## 2. Throttle Setup – Throttle Zero and Throttle Scaler

- Throttle Zero – This is used to synchronize the throttle position sensor signal and what the ECM considers closed throttle. The calibration procedure for this is outlined on this screen. If this number is incorrect, Closed Loop Idle Air Control, Idle Spark Stabilizer and Stall Saver will not work properly.
- Throttle Scaler – This multiplier is used to scale up or down the TPS reading to achieve the correct throttle position percentage at WOT(wide open throttle). With the throttle fully depressed, adjust this value until the percentage at WOT is 99.6%. On this system 99.6% is wide open throttle. Always be sure to check the Throttle Zero value by using the procedure in the software after adjusting the Throttle Scaler.

## 3. Advanced Idle Calibrations

- Throttle Follower Intro – This value represents the number of steps per percentage of throttle opening the IAC (Idle Air Control) valve will open as the throttle is opened. This acts as a buffer when under a quick deceleration to help the transition from open throttle to closed throttle. Some carbureted applications had a dashpot to dampen a quick snap of the throttle. This adjustment does the same thing, only with the IAC. A value of 1 will cause the ECM to open the IAC one count per 1% of throttle position.
- Vehicle Speed Follower Intro – This value represents the number of steps per vehicle speed (MPH) the IAC valve will open. This is especially useful on a long deceleration down a hill where the throttle is closed and the engine is still above the Desired Idle Speed. Without the Vehicle Speed Follower, the ECM will try to bring the idle down to the set Desired Idle Speed and fully close the IAC. Once the vehicle came to a stop, the engine speed would droop below the Desired Idle Speed and almost die because of the time it takes to open the IAC from its fully closed position.
- Follower Decay – This is the rate in which the Throttle Follower is decayed out. How many seconds it takes to bring the IAC back to its Idle Speed Position. If the engines idle hangs or stays higher than normal, increase this value. If the engine idle droops and almost dies, decrease this value.
- Stall Saver – This is a multiplier used to set a RPM below the Desire Idle Speed in which the Stall Saver goes into effect. So if the idle speed is 750 rpm and the value in this field is set at 0.7500, then the Stall Saver will enable at 562 rpm. Stall Saver adds IAC counts (opens) and advances the ignition timing to keep the engine from stalling.
- Stall Steps – This is the number of IAC steps added by the ECM when in Stall Saver mode. This number will be added every .125 seconds or 8 times per second. The more steps added, the more aggressive the ECM will try to recover the engine from stalling.
- Crank IAC Position – This is the IAC cranking position based on coolant temperature. When the ignition is turned to the on position the ECM will move the IAC to this position to give the engine the correct amount of air to start. The larger the number the higher the engine speed will flare when it first fires up. This is why it is not necessary to hold the throttle open while cranking a fuel injected engine, as it most likely would be on a carbureted engine.
- IAC Max Position – This value is the upper limit for how many counts the IAC can open to. These values are setup at the factory and the Perfect System Calibrations

already have them. Under normal circumstances this value will not need to be changed.

- IAC Max Base Position – This is the maximum IAC position without throttle follower, stall saver or load anticipation added. These values are setup at the factory and the Perfect System Calibrations already have them. Under normal circumstances this value will not need to be changed.

## Section 6: Setup

### 1. Sensors – IAT Sensor

- IAT Sensor – This is where the Intake Air Temperature Sensor input to the computer is enabled or disabled. If an IAT Sensor is present, enable this input. Calibration of the fuel via air temperature must be entered under the Fuel Screen. The IAT sensor calibration is useful to remove a slight amount of fuel as the air temperature increases or to add a slight amount of fuel as the air temperature decreases. On a really cold day, 32deg F and below, this adjustment can be used to enrich the fuel slightly.

### 2. Oxygen Sensor – Enable/Disable

- No Fuel Trim - This is exactly what it says, "No Fuel Trim" meaning the engine will run directly off of the Base Fuel Table values only. This means the O2 system has been completely disabled. When using an external wide band O2 sensor to monitor the exhaust air/fuel ratio, this will need to be selected.
- Stock Closed Loop – This is only used with a stock narrow band O2 sensor. All PERFECT systems use this type of sensor when no wide band O2 sensor is present.
- **These next two choices REQUIRE the use of a NGK AFX wide band Oxygen Sensor Kit P/N 91101.**

**NOTE: Included in this kit is a wideband interface harness with the purpose of connecting a NGK Wideband Sensor P/N 91101 into the main engine harness. Simply match and connect the wires based on their colors and plug into the O2 connector on the engine harness. Be sure and follow the instructions on the Wideband display module to do a free-air calibration before inserting the NGK O2 Sensor into the exhaust pipe.**

- Wideband Monitor – This is only used with the NGK AFX wide band kit. Its purpose is to accurately measure the oxygen content in the exhaust to indicate if the engine is receiving too much fuel or not enough fuel. More oxygen is lean and less oxygen is rich. The gauge on the Dashboard of the software that displays, "O2 Sensor" will indicate what the air/fuel ratio is in the exhaust. This gauge will not give an accurate measurement when a narrow band O2 sensor is being used.
- Wideband Closed Loop – This is to enable closed loop O2 fuel trim after the base fuel table has been thoroughly calibrated. The ECM will compare the Air/Fuel ratio value in the Target Air/Fuel ratio table to the actual value read in the exhaust. The ECM has the authority to change the amount of fuel plus or minus 20% of the

values in the Base Fuel table. This is why it is best to have the Base Fuel Table's values within at least 20% of the desired Air/Fuel ratio.

### **3. Fuel Pump – Prime Time at Keyup**

- Prime Time at Keyup – This is the amount of time the fuel pump will run when the ignition switch is initially turned to the on position. Its how the computer primes the fuel rail with pressurized fuel before the engine is being cranked to lessen the amount of time for fuel to be delivered and the engine to start. Three seconds is usually more than enough time to prime the system.

### **3. Rev Limit**

- Engine Speed Limit based on Coolant Temperature – This is the Rev Limiter on the Perfect System. Cold engines and overheating engines need to have a lower rev limit, than engines at normal operating temperature.

### **4. Aux Output – NOT SUPPORTED IN PERFECT APPLICATIONS**

### **5. Fan 1 – On Temperature/Off Temperature**

- On Temperature – On all PERFECT systems this is the temperature in which the ECM will provide a ground signal to an electric cooling fan relay. Set this temperature at approximately 20 degrees Fahrenheit lower than the normal engine operating temperature.
- Off Temperature – On all PERFECT systems this is the temperature in which the ECM will take away a ground signal to an electric cooling fan relay thus turning the fan off. Set this temperature at approximately 10 degrees Fahrenheit lower than the On Temperature set point in order for the fan to run continuously. In most cases, the electric cooling fan will not need to cycle on and off, but if such operation is desired the On and Off temperature set points will need to be adjusted.

### **6. Fan 2 - NOT SUPPORTED IN PERFECT APPLICATIONS**

### **7. Set Timing – Enable/Disable**

- By enabling the "Set Timing" mode, the ECM will force the spark advance to 10 degrees of base spark timing. At this point, adjust the distributor until the base timing tab is showing 10 degrees of advance. Lock down the distributor and then disable the Set Timing function. This function is used to synchronize the distributor advance to the ECM advance. In other words, the ECM and the Engine's distributor are now calibrated to each other. This function is only used on adjustable distributor ignitions engines.

**The PERFECTION software has been designed specifically for use with the Delphi MEFI-4 engine control module supplied by Painless in the PERFECT Engine Management System. This programming software is not compatible with any other MEFI ECM.**

Please note there are early and late versions of the PERFECT ECM. The early version only has the Delphi serial number on the label located on the back of the ECM. If you have this ECM you will need to send it in to Painless to have the latest base calibration flashed onto the ECM. Please contact Painless at 1-800-423-9696 for a return authorization and shipping instructions. There is no charge for this upgrade. **Be sure to send in the purple USB Key Number (as seen below) with your Purple USB key.**

The later version of the PERFECT ECM will have a USB key number in addition to the Delphi serial number. If you have this version of the ECM the USB dongle included in this software kit must be sent to Painless so it can be matched with the USB key number on the ECM. Again, please contact Painless for shipping instructions and make sure you send in the **purple USB Key Number (as seen below) with your Purple USB key.**

PERFECT software can only be used with the ECM and dongle for which each USB key number has been assigned.



**Perfect Performance Products, LLC** shall in no event be liable in contract or tort (including negligence) for special, indirect, incidental, or consequential damages, such as but not limited to, loss of property damage, or any other damages, costs or expenses which might be claimed as the result of the use or failure of the goods sold hereby, except only the cost of repair or replacement.