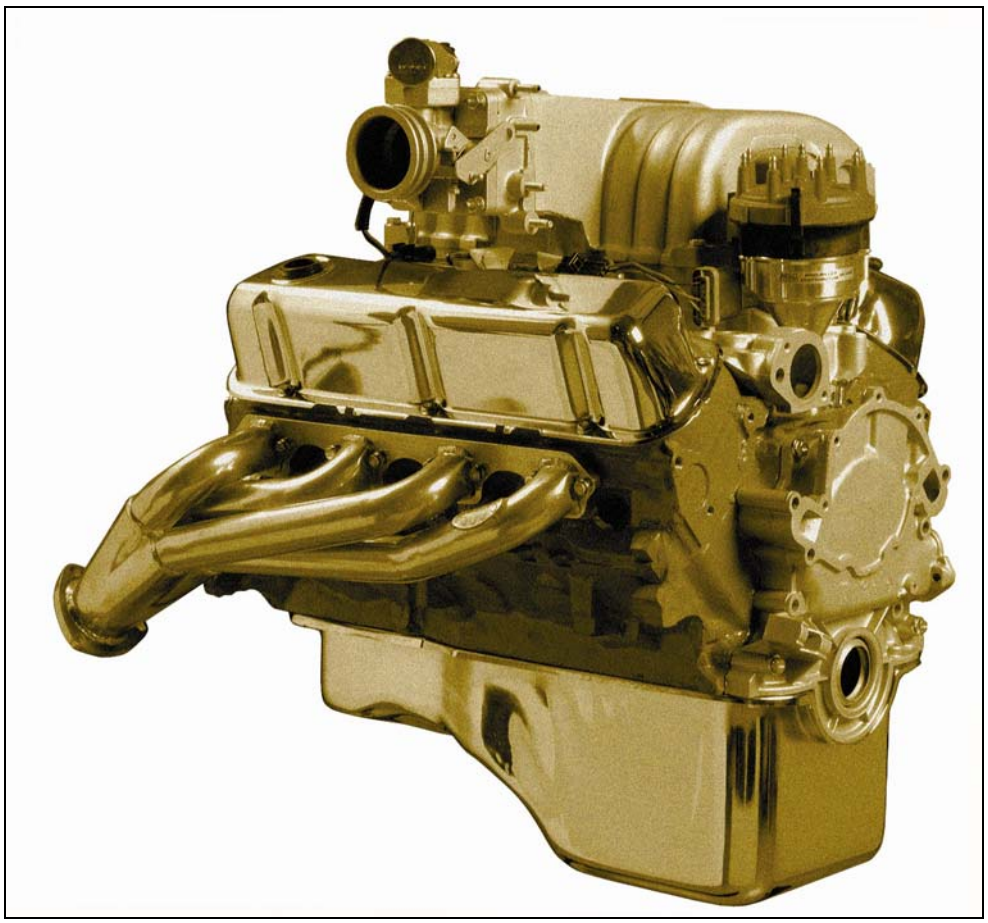
Wire Harness Installation Instructions

Part # 65120 – 1986 – 1993 (5.0L H.O) Ford Engines
Part # 65121 – 1994 & 1995(5.0L H.O) Ford Engines



Manual # 90539

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We have provided the most accurate instructions possible and are always concerned about corrections or improvements to be made. If you have found errors or omissions, or if you simply have a suggestion concerning these instructions please write us at the address on the cover and let us know about them. Or, send us a fax to (817) 244-4024.
We appreciate your business.

For Technical Questions

E-mail: tech@painlessperformance.com

Tech line: (800) 423-9696

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P/N 90539 PERFECT PERFORMANCE MANUAL
April 2008

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1.0 INTRODUCTION

You have purchased what we at Perfect Performance Products, LLC believe to be the most up-to-date and easiest-to-install automotive fuel injection system on the market. It is designed for easy installation, even with little or no automotive electrical experience.

This is a complete wiring system for the Ford 5.0L H.O. engine, when placed in a transplant environment. All of the circuits needed by the Perfect ECM to efficiently control the fuel injection system are included.

The ECM, Fuse Block, Relays, and MAP Sensor can easily be mounted under the dash. Most of the wiring in the harness has been pre-terminated to the proper connector and has been color-coded or labeled.

The Perfect EMS harness has been divided into three major groups:

ENGINE GROUP	Includes wiring for the fuel injectors, distributor, sensors, constant power, coil ignition power and ground wires.
DASH GROUP	Includes ignition feed wire, ALDL plug connector, check engine light, MAP Sensor, TACH wire, system relays, fuse block, and ECM plugs.
TAIL SECTION	Power wire for the fuel pump.

2.0 ABOUT THESE INSTRUCTIONS

The contents of these instructions are divided into 8 major sections:

1.0 Introduction
2.0 About These Instructions
3.0 Tools Needed
4.0 Pre-Installation and Harness Routing Guidelines
5.0 General Installation Instructions
6.0 65120/65121 Fuel Injection System Kit
7.0 Start-Up
8.0 Trouble Shooting Instructions and Trouble Codes

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. Always pay careful attention to any ***Notes*** or any text labeled **CAUTION**.

3.0 TOOLS NEEDED

The following tools are required:

Crimping Tool	***Note: Use a quality tool to avoid over-crimping.***
Wire Stripper	
Electric Drill	
1 5/8” Hole Saw	(for rubber grommet in firewall)
Feeler Gauge	(for TPS set-up)

4.0 PRE-INSTALLATION AND HARNESS ROUTING GUIDELINES

The installation of your harness consists mainly of two parts:

- The physical routing, positioning, and plugging-in of the sensors, injectors and ignition system.
- The electrical connection of the individual circuits.

These two major tasks are not separate steps, but are integrated together.

How to physically route the harness in your vehicle depends a great deal upon the particular make/model of your vehicle and to what extent you want to secure and conceal the harness. We do offer some general guidelines and routing practices starting in **Paragraph 4.3**, GENERAL installation instructions in **Section 5.0**, and precise instructions concerning the electrical connections you will have to make beginning in **Sections 6.0**. To help you begin thinking through the installation of your wire harness, read the following sections:

You should get to know the particular engine that you are using:

- OEM Ford Fuel Injection Systems use either a Mass Air Flow (MAF) sensor or Manifold Absolute Pressure (MAP) sensor. The Perfect 65120/65121 systems ECM use a Manifold Absolute Pressure (MAP) sensor only.

4.1 Painless requires the use of the parts listed in **Table 4.1.** These parts meet all requirements and are compatible with the PERFECT system. The numbers listed are Ford, Motorcraft, AC Delco and GM part numbers.

4.2 Familiarize yourself with the harness by locating each of the harness groups and by looking at the connectors on the wire ends.

4.3 Decide where the computer and sensors will be mounted in the vehicle. PERFECT wire harness kits are designed to mount either under the dash or in the lower right side kick panel.

4.4 A good exercise is to lay out the wire harness on the engine and determine the optimum placement for the firewall grommet on the vehicle. Next familiarize yourself with all of the connectors and harness breakouts. After drilling the hole for the firewall grommet in the firewall, route the harness from the inside of the vehicle into the engine compartment. Use caution not to chafe or cut through the insulation on any of the wires on the harness.

4.5 Route the harness away from exhaust manifold or headers and carefully around accessory brackets. Factory harness clips located on the valve covers and intake manifold provide extra protection from hazards and also provide places for tie wraps or other support.

4.6 Always route the harness away from sharp edges, exhaust pipes, and hood hinges.

4.7 Support the harness approximately every 6 inches to eliminate any unnecessary tension on the harness.

4.8 Allow enough slack in the harness at places where movement could possibly occur (body to frame, frame to engine, etc.)

4.9 The wires should be bundled into harness groups. Whenever possible use tape, tie wraps or split loom to support the harness on the engine and body.

65120/65121 FUEL INJECTION KIT

Description	Ford	Motorcraft	AC Delco / GM #
Thick Film Ignition module (TFI)……..	E6SZ12A297A……	DY–504	
1994-5 Pickup Coil (replacement only)….	E9TZ12A112A……	DU-50	
Throttle Position Sensor (TPS)…….….	E6AF9B989CA……...	CX–1133	
1994 Throttle Position Sensor (TPS)…..	F4SZ-9B989-AA……	DY-987	
1995 Throttle Position Sensor (TPS)…..	F1SZ-9B989-AB……	DY-987	
Intake Air Temperature Sensor…….....		25036979	
Engine Coolant Temperature Sensor……...		25036979	
Heated Oxygen Sensor…….		AFS - 105	
Ignition Control Module …….		D – 1986 - A	
Knock Sensor……		10456126	
Manifold Absolute Pressure……....		16137039	
Idle Speed Control Actuator……..……	E9AZ9F715BA……..	CX1824	
Ignition Coil……..….	F7PZ12029AA……..	DG470	

Table 4.1 Compatible Parts List

5.0 GENERAL INSTALLATION INSTRUCTIONS

CAUTION:

- **Do not disconnect the battery or computer connector(s) while the ignition is on.**
- **Do not short any wire 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.**
- **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 have become bent.**
- **The fuel pump/regulator MUST maintain 45 P.S.I. (engine running)**

5.1 GROUNDING THE VEHICLE

A perfectly wired automobile will not have problems if everything is properly grounded. Do not go to the effort of installing a quality wire harness, only to neglect proper grounding.

5.1.1 Connect a ground strap or cable (minimum of a 2-gauge wire) from the negative battery terminal to the automobile chassis (frame).

5.1.2 Connect a ground strap from the engine to the chassis (frame). DO NOT RELY UPON THE ENGINE MOUNTS TO MAKE THIS CONNECTION.

5.1.3 Connect a ground strap from the engine to the body.

5.2 ROUGH INSTALLATION

CAUTION: Disconnect the power from your vehicle by removing the negative cable from the battery.

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

5.2.1 Position the computer, fuse block, relays and sensors in their intended locations.

5.2.2 Drill a 1-5/8” hole for the firewall grommet near the computer for the engine group and tail section to pass through.

5.2.3 Route the engine group and tail section through the hole. Push the grommet (already installed on the harness) into the hole until it is seated.

5.2.4 Route the dash group over to its intended location.

5.3 HARNESS ATTACHMENT

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

5.3.1 Permanently mount computer. You should also mount the parts (sensors, relays, etc.) that will be used for your engine at this time. These parts will vary by application.

5.3.2 Mold harness groups to the contour of the dash, engine, frame, etc. Remember to route the harness away from sharp edges, exhaust pipes, hinges, and moving parts.

5.3.3 Attach harness groups to your automobile with clips or ties staring 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.

5.3.4 When used every 1-1/2” or so on the visible areas of the harness, 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.

5.4 TERMINAL INSTALLATION INSTRUCTIONS

Note: In the following steps you will be making the circuits connections. Before you start, you should carefully read Sections 6.0 through 8.0, as applicable, and continually refer to the wire connections 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.

5.4.1 Have all needed tools and connectors handy.

5.4.2 Select the correct terminals for the wire and application.

5.4.3 Determine the correct wire length and cut wire. Remember to allow enough slack in the harness and wires at places where movement could possibly occur. DOUBLE CHECK YOUR CALCULATIONS.

5.4.4 Strip insulation away from wire. Strip only enough length necessary for the type of terminal you are using.

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

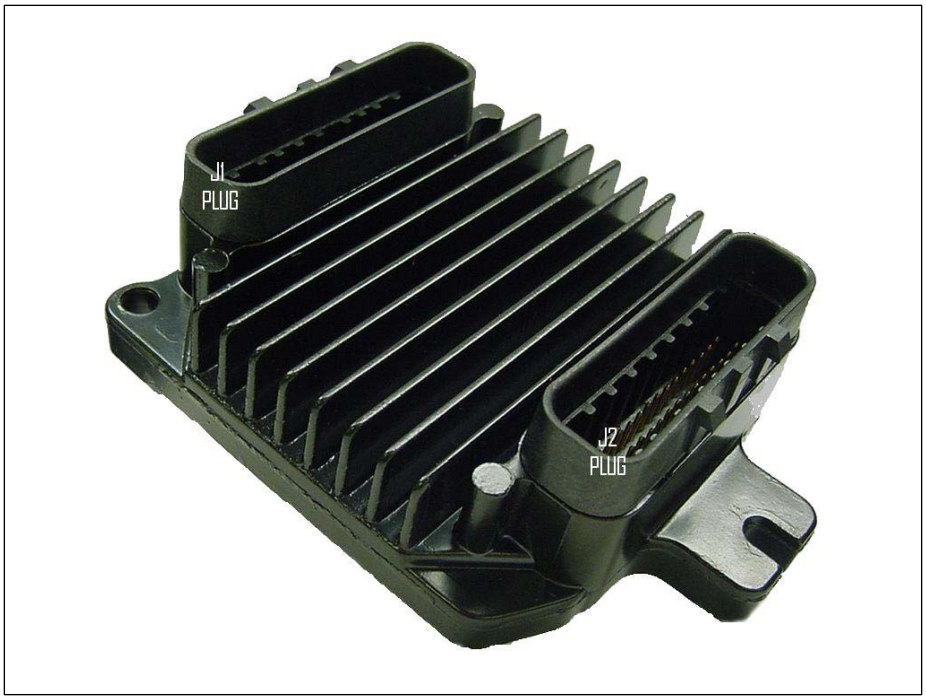

FIGURE 5.1 PERFECT ECM

5.4.5 Crimp the terminal onto the wire.

5.4.6 Connecting the wires and connectors throughout the harness is a repeating process. Make sure that each wire is first properly routing and then attach. DO NOT ATTACH THEN ROUTE AFTERWORD.

5.4.7 When all wires are attached, tighten the mounts and ties to secure harness permanently.

5.4.8 Attach the connectors to the computer BEING CAREFUL NOT TO BEND ANY PINS.

5.4.9 **Only after all connections have been made** throughout the harness, connect the battery to the vehicle.

6.0 FORD 5.0 WIRING HARNESS INSTALLATION INSTRUCTIONS

(65120 will control the 1986-1993 engines) (65121 will control the 1994-95 engines)

6.1 CONTENTS OF THE 65120 and 65121 KITS

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

- The main wire harness with the connectors already on the ends of most of the wires.
- Thick Film Ignition Adaptor(65120 only), Distributor Pigtail(65121 only)
- Fuel Injection Installation Instructions P/N 90539 (this booklet)
- ECM, ECM mounting screws and Relays

6.2 DASH SECTION INSTALLATION

The wires in this group consist of the ALDL connector, the check engine light, fuse block, relays, and tach wire, ignition hot wire, MAP sensor, and electric fan relay ground wire.

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

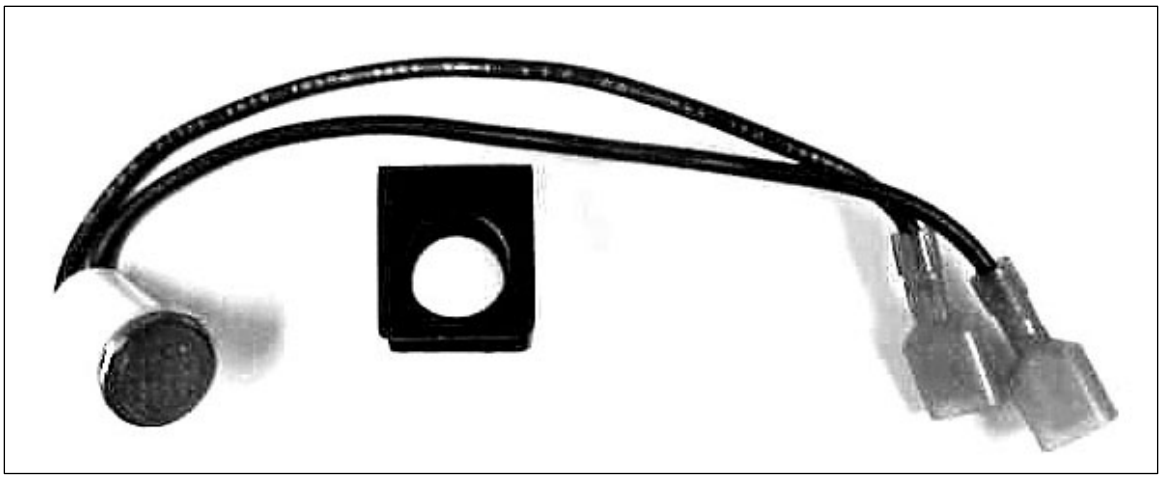

Figure 6.1 Check Engine Light and Bracket

Figure 6.2 (TPS) Throttle Position Sensor (1986-1993)

Figure 6.2 (TPS) Throttle Position Sensor (1994-1995)

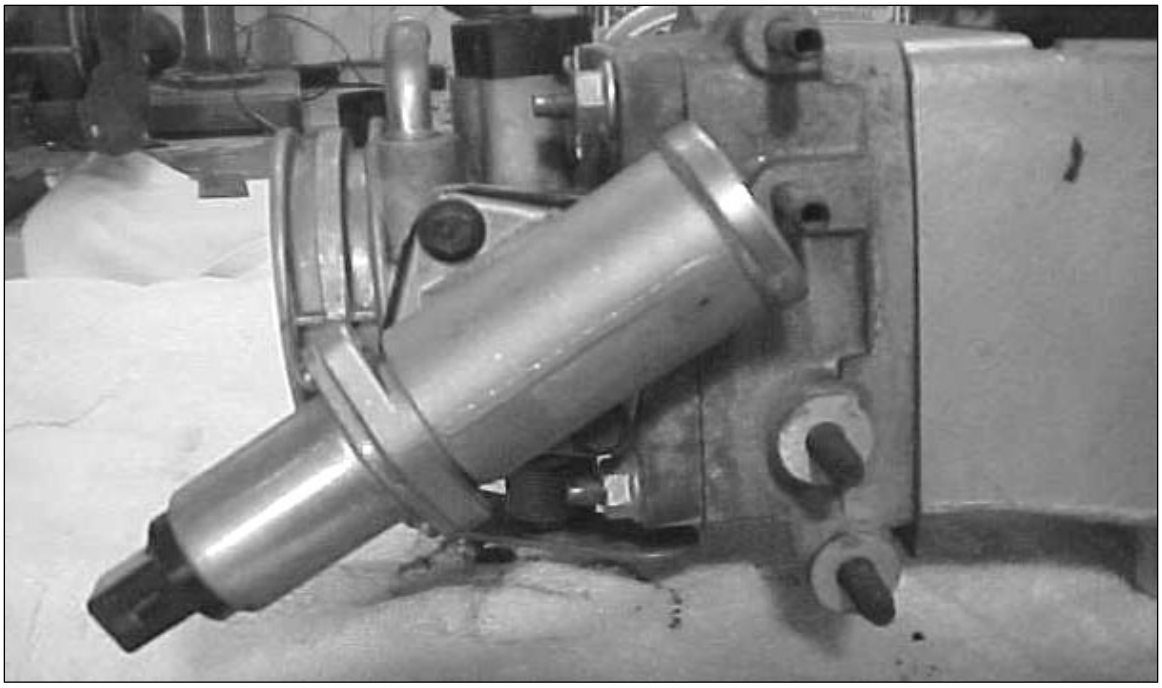

Figure 6.3 (IAC) Idle Air Control Valve

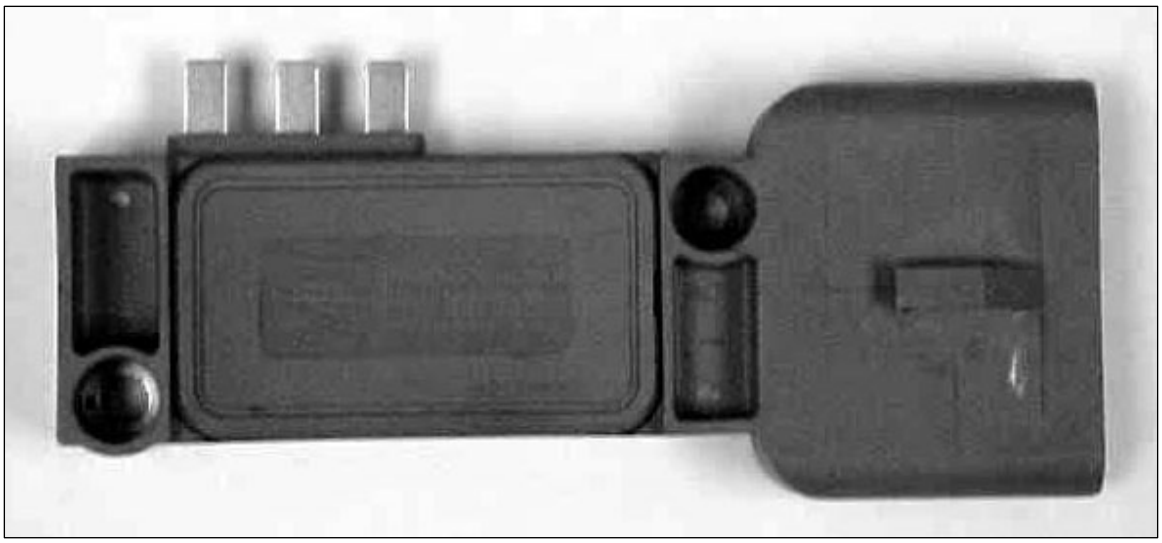

Figure 6.4 (TFI) Thick Film Ignition Modules (1986-1993 only)

Figure 6.4 (Late Distributor connection 1994-1995 only)

Figure 6.5 (MAP) Manifold Absolute Pressure Sensor

Figure 6.6 (HO 2) Heated Oxygen Sensor

Locate the Pink and Pink/Black wires (labeled IGN #1 and IGN #2) and attach them to an ignition hot **fused** 12V source. **POWER IS REQUIRED WHEN THE KEY IS IN THE RUN AND START POSITION**. IGN #1 (PINK) is the power for the computer and relays. IGN #2 (PINK/BLACK) is the power wire for the Ignition Coil.

6.3 ENGINE GROUP INSTALLATION

The Engine Group is designed to be separated into left side (driver), right side (passenger). Each side is tie-wrapped separately, **but not labeled.**

Note: The plenum MUST be removed to install the harness.

Note: If you have not already done so, separate the tail section (fuel pump) from the engine group and place it out of the way.

A. Locate the BLACK/WHITE wires labeled **GROUND # 1** and **#2** in the harness that end in a ring terminal. Ground this wire to the engine. An intake manifold bolt is the proper place. These wires are for the grounding source for the ignition and ECM. The engine will not correctly if not attached properly.

B. Starting at the rear of the engine, using **Table 6.2**, and the **Figures** in **Section 6.3**, begin attaching the connectors to their proper places and THEN secure the harness to the engine when ready.

C. Locate the RED wire labeled **STARTER RELAY** and route it to the starter relay. Attach this wire to the BATTERY post on the relay.

Color	# of Positions in Connector	Labeled	Connect To
WT/BK, GN/WT, GRN. WT/LTBL, BK/WT, GRY BLU, GN/BK, BN/WT PK/BK	32	J1	ECM J1 PLUG
ORG, GRY, BLK., PPL YLW, LT GRN, OR/BK. OR/RD, PK/BK, TAN, BLU WHT	32	J2	ECM J2 PLUG
RED, RD/WT, RD/BK, PK/BK OR/WT, ORN	6	FUSEBLOCK	
GRN, GN/BK, BK/WT	5	A/C SIGNAL RELAY	
PK/BK, PNK, BK/WT, RED	5	IGNITION RELAY	
ORN, GRY, GN/WT, PK/BK, RED	5	FUEL RELAY	
BN/WT, PK/BK, ORN, BK/WT, OR/BK WT/BK	10	DLC	
PNK		IGNITION #1	FUSED IGN. 12V SOURCE
BLK, GRY, LTGN	3	MAP	MAP SENSOR
GRY		TACH.	TACHOMETER
GN/WT		FAN RELAY	ELECTRIC FAN RELAY GROUND

Table 6.1 Dash Section

Colors	# of Positions in Connector	Labeled	Connect to
PK/BK		IGN #2	FUSED IGN 12V SOURCE
BK/WT		GROUND #1	ENGINE GROUND SOURCE
BLUE	1	KNOCK	KNOCK SENSOR
BLK, TAN	2	IAT	INTAKE AIR TEMP. SENSOR
BK/WT		GROUND #2	ENGINE GROUND SOURCE
BK/WT, PK/BK, PUR, BLK	4	OXY	OXYGEN SENSOR
RED		STARTER RELAY	STARTER RELAY BATT. TERMINAL
OR/RD, BLK, PK/BK	6	TFI	THICK FILM IGNITION MODULE
PK/BK, WHT	3	COIL	IGNITION COIL
PK/BK, WHT, BLK, WHT	4	ICM	IGNITION CONTROL MODULE
BLK, BLU, GRY	3	TPS	THROTTLE POSITION SENSOR
PK/BK, WT/LTBL	2	IAC	IDLE AIR CONTROL VALVE
GRN		A/C SIGNAL	A/C COMPRESSOR
BLK, YLW	2	CTS	ENGINE COOLANT TEMP. SENSOR
PK/BK, BLU	2	INJ. #	INJECTORS 1, 4, 6, 7
PK/BK/GRN	2	INJ. #	INJECTORS 2, 3, 5, 8

Notes:

1. If you have headers you may have to relocate the heated oxygen sensor for proper clearance. Painless also has bungs for you HO2 sensors, Painless part number 60406.

Table 6.2 Engine Section

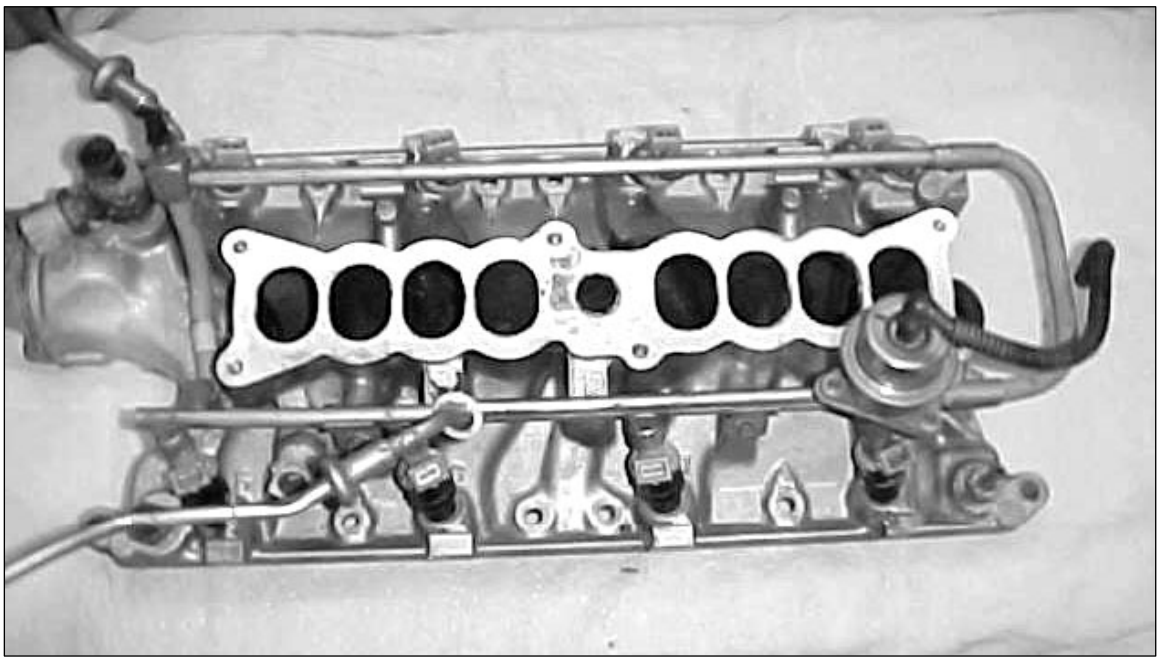

Figure 6.7 Intake (with plenum removed for harness installation)

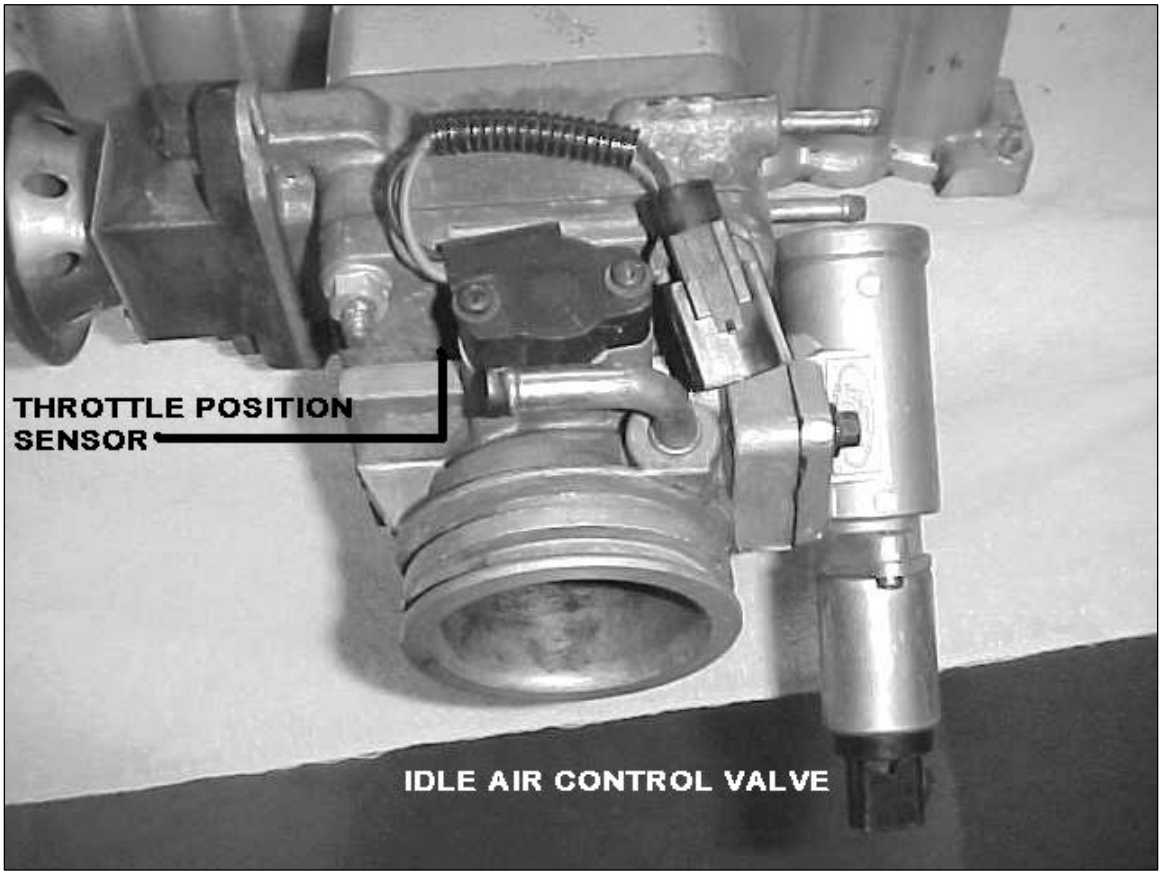

Figure 6.8 Locations of TPS & IAC (1986-1993 only) (1994-5 TPS see Figure 6.2)

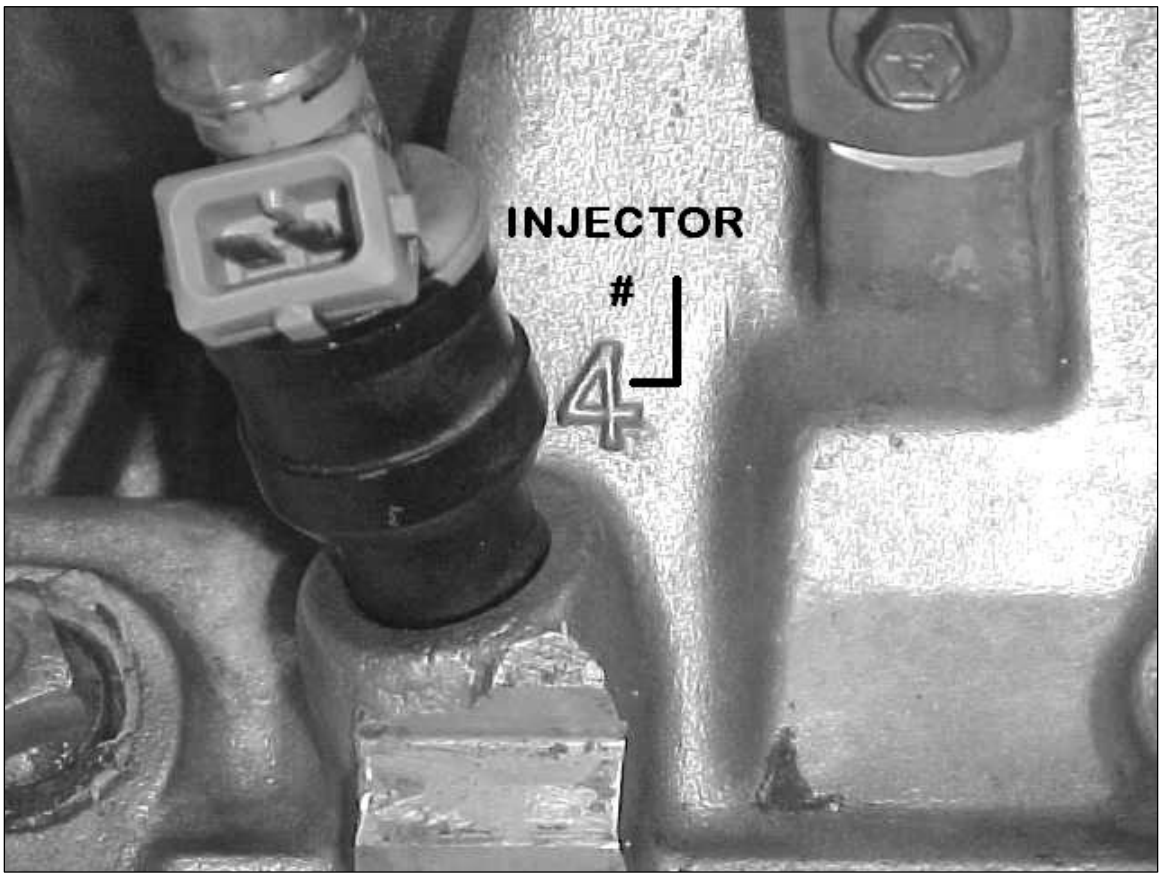

Figure 6.9 Injector # Locations (numbered on stock intake)

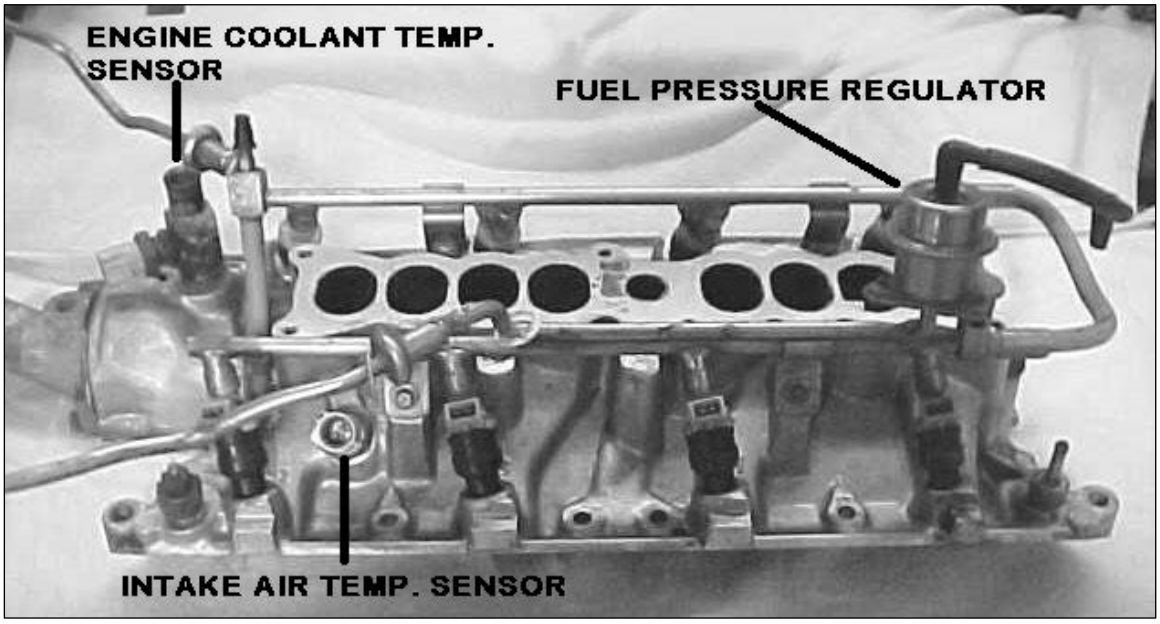

Figure 6.10 Locations of IAT & ECT

6.4 TAIL SECTION INSTALLATION

A. 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.

B. Take the long GRAY wire (labeled FUEL PUMP) and route it to the fuel pump. This is the power wire for the fuel pump.

Wire	# of Positions	Labeled	Connect to
Gray		FUEL PUMP	FUEL PUMP B+

Table 6.3 Tail Section

7.0 FORD 5.0 H.O THROTTLE PLATE AND TPS SET-UP

*** The following procedure is absolutely critical for the engine to idle properly, accelerate well and perform at the levels the Perfect System has been calibrated for.**

A. Back out the throttle plate stop screw until it clears the throttle arm by 0.020”. **See photo below**.

B. Insert a .020” feeler gauge between the throttle stop screw and throttle arm. Turn the screw in until it just contacts the feeler gauge. (It may be necessary to gently hold the throttle plate closed, in order to detect when the contact is made.)

C. Remove the feeler gauge, and turn the stop screw in an additional 2 ¾ turns.

D. Using a digital voltmeter, probe the “TPS” ground (black wire) and “Signal return” (blue wire).

F. Start the engine and adjust the TPS so that the voltmeter reads .98V (engine running, throttle arm in contact with stop screw). In some cases, it may be necessary to elongate the adjustment slots on the TPS, in order to obtain .98V.

8.0 FORD START UP

8.1 The fuel system must be pressurized. This is done by turning the key on and off several times.

Note: Inspect your fuel lines for leaks, from the tank to the engine.

8.2 Start your engine and listen for noises that would indicate a problem, while inspecting your engine for fluid leaks.

8.3 You are now ready to set your initial engine timing.

8.3.1 Using a jumper wire, jump terminals A and B of the ALDL plug together.
8.3.2 Loosen your distributor and set your initial timing to the factory setting of 10˚ BTDC.
8.3.3 Tighten the distributor back down and check timing.
8.3.4 Shut off engine.

8.4 Check your HO2 sensor bungs for leaks while your vehicle is running.

9.0 TROUBLE SHOOTING INSTRUCTIONS

Normally, the "check engine" light should come on when the ignition is initially turned on, and then go out a few moments after the engine starts running. If it reappears, or stays on while the engine is running, the computer has detected a problem and a trouble code has been set.

9.1 THE "CHECK ENGINE" LIGHT

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

A. The first digit (the "tens" digit) of the code is flashed quickly, followed by a brief pause, and 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 indicates code 32.
B. The code will repeat itself and then the next code, if any, will be displayed in the same manner.

Figure 6.11 ALDL Plug

9.2 RETRIEVING TROUBLE CODES FROM THE COMPUTER

9.2.1 In order to retrieve the trouble codes stored in the computer, locate the ALDL plug. Take a jumper wire and jump terminals A and B together. Turn the ignition switch to the "ON" position, but leave engine "OFF."

9.2.2 After you have read all codes, write them down for reference. Turn the key "OFF." Remove the jumper wire from the ALDL. This procedure will take a few minutes. **Do not rush.**

9.2.3 Take the codes one at a time and match then to the codes in **TABLE 9.1**. This will tell you in which circuit the computer has detected a problem with.

Note: A code indicates a problem in a specific circuit, NOT THAT A PARTICULAR PART IS BAD.

9.2.4 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 circuit for any broken, shorted, or exposed wires. Finally, insure all ground wires are clean and secure.

9.2.5 Your ECM may have codes 51 & 81 stored in it. These codes automatically are put in at the time of the ECM programming from PERFECT.

9.2.6 If you are getting a code from your computer and need to clear the code, other than code 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 terminals A to terminal B of the ALDL.
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" but engine "OFF."
G: Recheck for codes.

9.3 WHEN TO CALL PERFECT PERFORMANCE TECH LINE

9.3.1 These harness kits have been built with the highest regard to strict quality control and tested before shipment. Before calling us please double-check all connections and perform basic trouble shooting (fuel pressure, timing, ignition system, etc.)

9.3.2 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.

Code #	Circuit Affected
12	All circuit read **(This is a normal code for the ECM)**
13	Oxygen Sensor Inactive
14	Coolant Sensor High Voltage (COLD)
15	Coolant Sensor Low Voltage (HOT)
21	Throttle Position Sensor (high voltage)
22	Throttle Position Sensor (low voltage)
23	Manifold Air Temp. (low temp. indicated)
25	Manifold Air Temp. (high temp. indicated)
33	MAP Sensor Circuit (high voltage)
34	MAP Sensor Circuit (low voltage)
41	Ignition Control (IC) (open circuit)
42	Ignition Control (IC) (grounded circuit)
44	Knock Sensor Inactive
51	Calibration Checksum
54	Oxygen Sensor Low V. (lean reading indicated)
55	Oxygen Sensor High V. (rich reading indicated)

Table 9.1 Trouble Code List

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.